THE MODEL ENGINEER

Vol 95. No. 2361 THURSDAY AUGUST 8 1946 6d

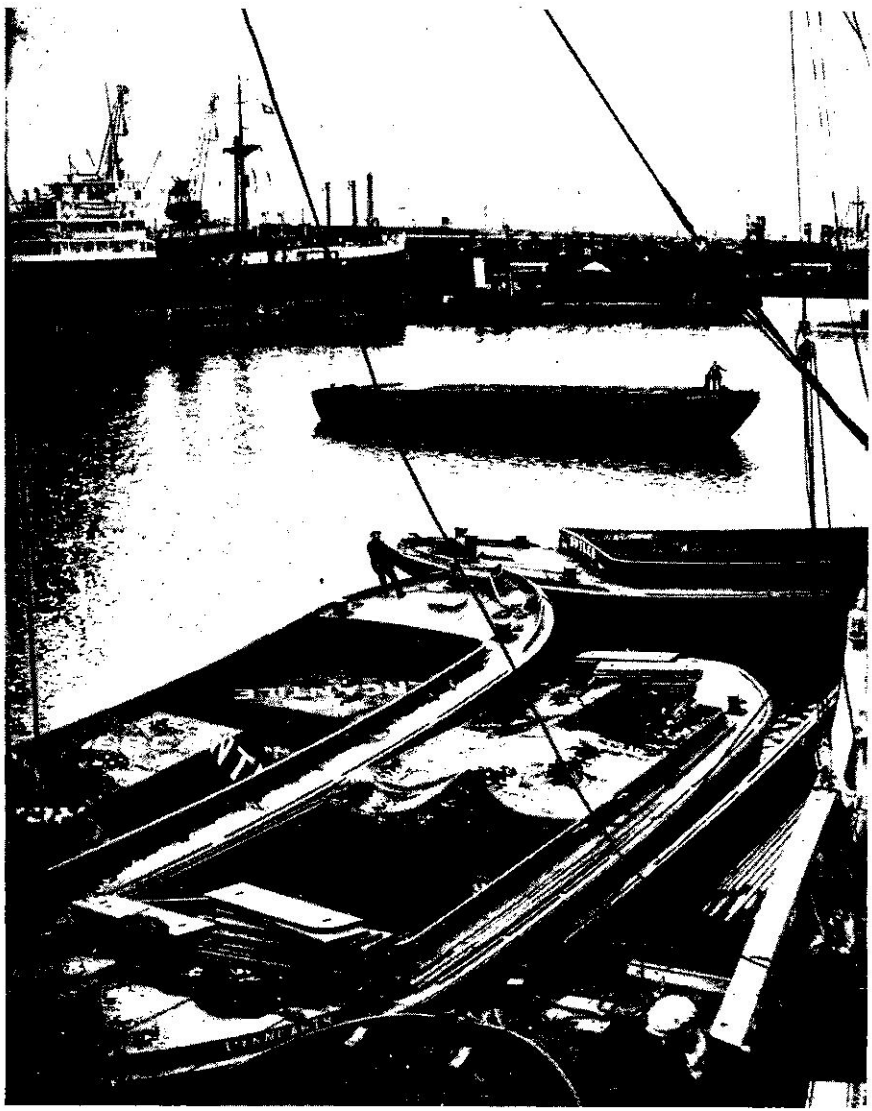

Photo by] [*C. B. Maycock*

King George V Docks, London. Dumb-barge study

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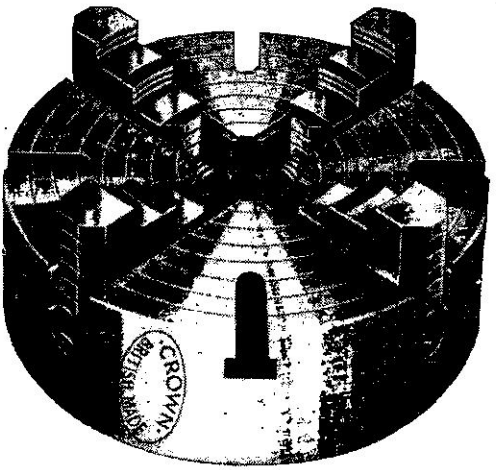

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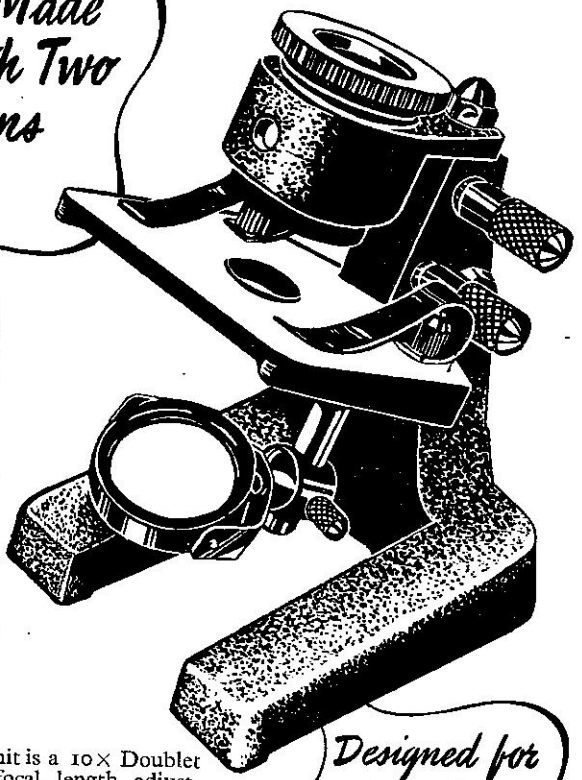

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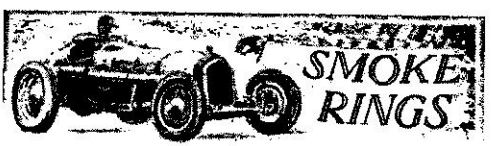
Percival Marshall & Co. Ltd., 23, Great Queen Street, London, W.C.2
VOL. 95. No. 2361. AUGUST 8th, 1946



Judging the Competition Models

AS there are over 250 competition entries and a most generous list of prizes and awards, the judges this year will have a rather formidable task. The work, however, is being divided among a panel of experts appointed by the two Societies who are organising the Competitions, and I have no doubt justice will be done without fear or favour. On the Committee of ten appointed by the S.M.E.E. there are two previous Championship Cup winners in the persons of Mr. E. W. Fraser and Mr. H. G. Eckert. Mr. G. P. Keen, a prize donor, is the President of the Model Railway Club, while Mr. J. N. Maskelyne and Mr. E. T. Westbury have both had considerable experience in judging at various local exhibitions. Mr. C. J. Hampshire is well known as an authority on marine engines and ship modelling, and Major D. H. Chaddock, Mr. K. N. Harris, and Mr. J. Latta are all outstanding personalities in the model engineering world. I have been invited to act as President of this most efficient committee, but in accepting this honour I have asked to be relieved from the detailed work of judging the various classes. As I have been chief judge at this exhibition on twenty past occasions I feel I have earned a little respite from the physically strenuous work of examining and comparing the merits of so many entries. I shall however take a keen personal interest in all the models on show, and if the official judges need a casting vote or any additional opinion on the making of a particular award my experience will be at their disposal The entries in the aircraft classes are in a specialised field, and their merits will be ably assessed by Mr. A. F. Houlberg and his colleagues of the S.M.A.E. Any competitor who receives an award at this year's show may feel that his distinction has been fully earned.

Enquiries and Appointments

SOME of our Exhibition visitors will no doubt like to make appointments to meet a mutual friend, or possibly some other reader of THE MODEL ENGINEER not personally known to them. This can be quite easily carried out by agreeing to meet at the stand of THE MODEL ENGINEER which will be found in the centre of the Hall, the day and time being mutually arranged in advance, by correspondence or otherwise. Enquiries during the show for information regarding any of the engineering competition or loan exhibits, or the awards, should be made at the stand of the Society of Model and Experimental Engineers, where Mr. E. L. Ashton, the Chief Steward, will be in constant attendance. Similarly, enquiries relating to the aviation exhibits should be made of Mr. A. F. Houlberg at the stand of the Society of Model Aeronautical Engineers, which body is responsible for this section of the show. Mr. P. G. A. Ennor, the General Manager of the Exhibition, will be found in the Secretary's office on the Dais, and will be pleased to deal with all enquiries of a general nature.

Taunton's Good Start

SOME time ago an effort was made to bring Taunton model engineers together in a local society. Due to wartime conditions, however, the movement hung fire. A further rallying note, but recently sounded, has been more successful. At a meeting convened by Mr. G. A. Lindner, and held in his garden, twenty members paid their first year's subscription. This is a very practical beginning, and promises well for future success. A cordial welcome is offered to other MODEL ENGINEER readers in the Taunton area, who should get into touch with Mr. G. A. Lindner, " St. Crispin," Trull Road, Taunton.

The Late Mr. P. F. Day

MANY Midland model engineers, and particularly those in the Nottingham area, will learn with regret of the passing of Mr. P. F. Day, the Managing Director of the Pinxton Collieries Ltd. He was a great believer in the value of models in the planning of plant alterations, and said that his company had saved considerable sums of money by having models made before new construction work was put in hand. Moreover, they were of much service to those workmen who could not read drawings in showing them exactly what was required. Mr. Day was a keen supporter of the Pinxton Society's annual exhibition. He always attended on the opening day, and brought some of his fellow directors and other prominent visitors with him. Mr. Fred Smith, who sends me this news, writes in the highest terms of his late chief.

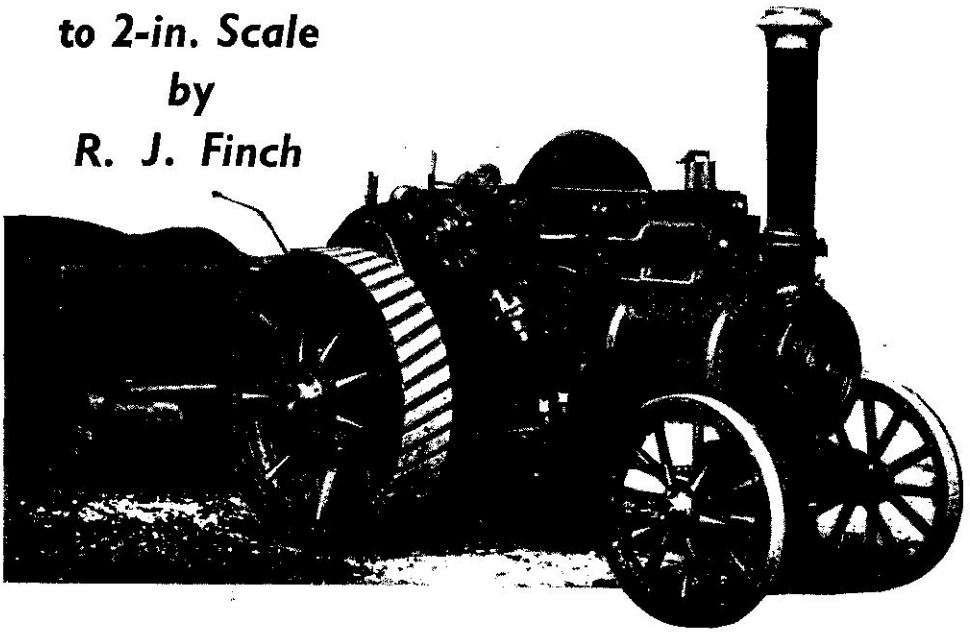
Percival Marshall

THE "M.E." TRACTION ENGINE

to 2-in. Scale

by

R. J. Finch



AFTER giving up running a car during the war and not being one to sit by the fire and read, I decided to get down to model engine making again after a lapse of a few years. Discussing the position with Allen, my son, age fourteen in 1942, we decided on THE MODEL ENGINEER traction engine, but we thought it would be much better to have a large one, so we decided to double up on the drawing generally, watching for parts where this could not apply. A believer in safety first, the boiler tube was obtained, $\frac{1}{8}$ in. thick solid drawn copper, and after making formers, the end-plate, etc., was flanged and drilled for riveting (3/32-in. copper rivets) pitched $\frac{5}{8}$ in. Where the side plates which hold motion works fix to the boiler, extra large stays were put in with centre tapped $\frac{1}{4}$ in. B.S.F. for set-screws. All bearings on crankshafts, second shaft and rear road-axle are ball-races, but housings for them are made rectangular so as to look like plain bearings. Improvements were made on THE MODEL ENGINEER drawings by cutting spokes of wheels in one spider-piece. Another extra was the differential; this, although not on THE MODEL ENGINEER drawing, is essential, otherwise skidding takes place on cornering

Three trucks were made, one for the driver and two for taking four children each; at times larger children got in. In fact, it has pulled four fourteen-stone men quite comfortably, but when coming to a hill the rear wheels spin round unless a sack is put on the road.

*Lathe Improvements

By Niall MacNeill

(Based on a lecture delivered to the Dublin S.M.E.E.)

REFERRING to the photo, Fig. 3, one should note the tommy-bar hole, for preliminary tightening of the extension-piece on the mandrel. The lips of this hole should be slightly bevelled, else the tommy-bar will raise burrs which will prevent the division-plate boss from sliding on, that is if it is a good close fit, as it should be.

A close examination of Fig. 3 will show that at the outer end of the extension-piece, a little step or "register" is machined. Some old division plates have rows of holes on both faces. The purpose of the "register" is to enable such a plate to be truthfully reversed on its boss, the bore of the extension-piece accurately matching the bore in the boss and the register being a correspondingly accurate fit in the hole in the plate. The extension-piece, therefore, has a secondary duty of serving as a reversing jig to locate plate and boss accurately together while one is being screwed to the other. In any case in which plate (whether purchased or home-made) and boss are separate pieces, provided the plate has a small and accurately concentric hole, the use of a piece having a "register" of the kind referred to will facilitate accurate assembly without need of rebating one part to receive the other.

Fig. 4 shows a division plate mounted by means of an extension-piece and illustrates a simple method of mounting the detent, i.e. by a shank having two studs and nuts to match whereby it is secured to one of the slots of the banjo plate.

Mandrel-Locking Device

The subject of dividing suggests another improvement in lathe headstock design, concerning which—however—it must be admitted that there may be some difficulty in applying the idea, and that appreciable increase in manufacturing cost may be involved. With certain types of dividing gear (worm-operated or using stout plates having large holes) reliance may be placed on the dividing apparatus itself to *hold* as well as *locate* the work, but it is to be doubted that even in these instances this is really good practice. Wedging, by means of a piece of wood or the like, is a crude expedient and in itself liable to cause misalignment. It is characteristic of old plates that the holes are small and shallow.

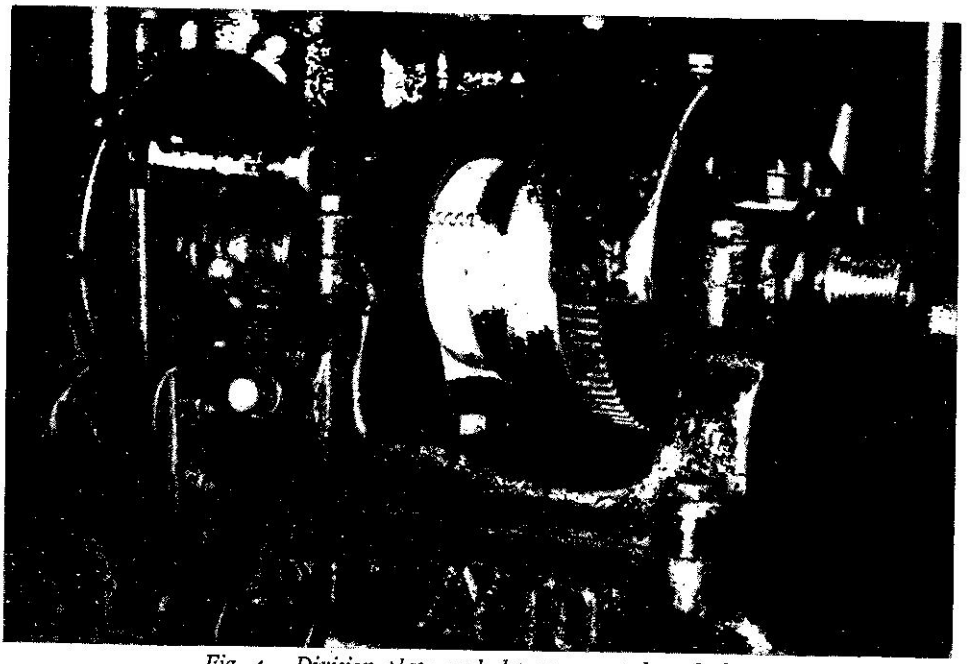


Fig. 4. Division plate and detent mounted on lathe

* *Continued from page 115, "M.E.," August 1, 1946.*

From the point of view of the amateur there may be something to be said for using that same kind of holes in making new plates. Liability to drilling inaccuracies is not so great as in making large holes of the right-through kind. Big holes cannot be used in a plate of reasonable size for any very large number of divisions. If a device, such as a thumbscrew and pad, for locking the mandrel in any position, could be embodied somewhere in the headstock, it would be a manifest convenience. Use of the headstock bearing adjustment as a locking device is, to my mind, scarcely an expedient to be recommended.

Headstock Pinion and Pulley Fixings

Apart altogether from their use as dividing appliances, it is obviously desirable that back gear pinions should be securely fixed to their respective shafts and the same applies to cone pulleys in non-back-geared lathes. In the cheaper machines we must doubtless be content with grubscrew fixings. A loose grubscrew tends not only to deform the indent made in the shaft to receive its point but to become progressively slacker in the screwed hole in which it is fitted. It is suggested, therefore, that all such screws should be examined, and if they are in any way slack replaced by oversize substitutes. The indent on the shaft should be sufficiently large to receive a substantial part of the pointed head of the screw and both should be matched as closely as possible in taper.

Thrust-Race Cowling

The lathe illustrated is not alone among its class in having the mandrel thrust bearing (ball race) outside the front journal bearing, i.e. immediately behind the mandrel nose, nor in lacking—as sold—a cowling to prevent intrusion of dirt and grit to this bearing. It is definitely suggested that this is not the best position for this bearing. It is a simple matter, however, for the owner to make good the deficiency of a dirt-excluding cowl. Fig. 4 shows a fitting of this kind mounted in position, and Fig. 5 shows it detached. It is simply a dome-shaped piece of sheet metal bored out to a running fit over the largest diameter of the mandrel nose. To this, a lug, also of sheet metal, is soldered. A hole is drilled in the lug, of such size and in such position, that the device is held in place by the simple expedient of using the oil-cup of the front mandrel bearing to secure it. In use it is packed with light grease.

I had the good fortune to find amongst the junk a dome-shaped pressing which fitted the job exactly. This was a junction-box cover from a scrapped "Bosch" car wiring system. If such a lucky find should not be forthcoming the fabrication of a suitable fitting might be a useful elementary lesson in metal spinning of a light kind not beyond the capacity of the lathe. Experiments at heavier and more complicated spinning jobs convince me, however, that they are a form of punishment to which small lathes of this class should not be subjected. If anyone wants to go in for metal spinning in a big way, either he should buy a specially designed lathe or look out for an old lathe of fairly robust proportions and adapt it to the purpose.

Lubricators

As supplied by the makers, many lathes of this class are innocent of any other provision for lubrication than plain holes, except perhaps at the headstock bearings. Manifestly, uncovered holes are just as efficient a means of admitting dirt and grit as they are of giving access to oil. It is a simple and inexpensive job—so much so that manufacturers have little excuse for leaving us to do it—to fit spring-lid oil cups such as are used on bicycles. If these are of the screwed-shank type the holes can easily be tapped to receive them, but take care to remove any tapping swarf before resuming the use of the lathe. The push-in kind, having slightly tapered shanks, if a good fit, are not a bad substitute. The positions in which such oil cups may be needed are :—

Back gear—both bearings.
Lead screw—both bearings.
Clasp-nut slide—hole in apron.
Spindle bearing in apron of racking handle.

Failing oil cups, even common screws (round or cheese-head) may be used. There are, in fact, two additional locations in which the latter are the more suitable provision—namely in the upper surfaces of the top and cross slides of the compound rest, just behind the keep plates. In the case of the cross slide, the head of the screw should be flush-fitting, the hole being counterbored to receive it. The object of these oil holes is to allow of a little oil being introduced occasionally to the feed screw bearings in the keep plates. Holes for lubrication are not normally provided in these locations, but in my opinion their provision—by drilling and tapping the slides and fitting suitable screws—is well worth while. The application of this idea is to be seen in Fig. 12. Quite appreciable roughness and wear can occur if the bearing of the screw in and against the keep plate is not kept well oiled and, while it is undoubtedly good practice to dismount these slides from time to time to clean and oil them, it is a convenience to be able to supply oil to the screw without having to dismount the slide or resort to the messy, wasteful, and uncertain procedure of squirting oil up from below.

Suds Cowl for Chucks

It seems clear that there is a somewhat prevalent disinclination among model engineers to make free use of coolant fluid when machining materials which call for its use. This is doubtless due, on the one hand to the messiness involved, and on the other to the inconvenience of providing suitable means of applying the coolant. Before coming to the latter aspect of the matter, let us—as we are proceeding from the headstock towards the tailstock—consider one simple means of minimising the messiness.

Of this there could be no greater nor more annoying manifestation than coolant centrifuged on to the worker's person and clothes and about the shop when working close to chuck or carrier. Very simply overcome—*vide* Fig. 6. The hood shown in this photograph is simply the lower half of a large cocoa tin partly opened out and as much of the bottom cut away as will clear the mandrel. A strap-iron arm is riveted—or could be soldered—to it. This arm has a slot formed in

its outer end. A cheese-head screw, seen in Figs. 4 and 6, for which a hole is drilled and tapped in the crown of the back gear guard, secures the hood in position when in use. The slot is open-ended, so that the screw need only be loosened to detach the hood. The length of the arm and slot are such as to permit, not alone some endwise adjustment but the application or removal of the hood without having to detach the chuck. The hood should be large enough to clear comfortably—even when chuck jaws are retracted—the largest chuck commonly used and deep enough to extend slightly forward of the jaws. If chucks of widely different sizes are used it may be desirable to make more hoods than one. A refinement of this scheme, thought of since the photograph was taken, is to provide a hole in the cowl through which the chuck key can be applied.

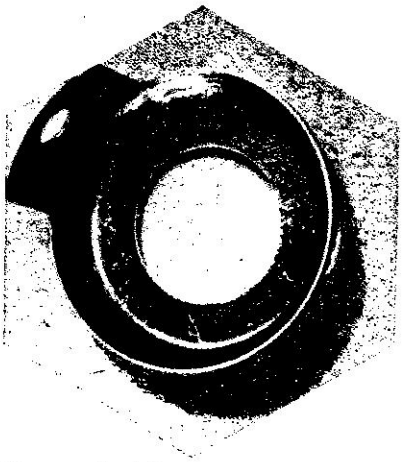


Fig. 5. Cowl for headstock thrust-race

Though it cannot serve to exclude dirt completely, a dirt-guard over the leadscrew unquestionably has the merit of affording the screw a large degree of protection, as for instance from an avalanche of iron turnings, possibly containing foundry sand, which may occur at a time when to stop and clean up would be an annoying interruption of the work in hand. But if worth fitting at all, a guard of this kind should be something better than the stumpy affair usually supplied.

Fig. 6 shows a guard fashioned from fairly light gauge steel tubing of $\frac{3}{4}$ in. internal diameter (to suit $\frac{5}{8}$-in. leadscrew), and made as long (6 in. in this case) as will just clear the leadscrew bearing bracket when the saddle is fed as far towards the headstock as it will go. All that is involved is to saw the tubing in halves lengthwise, discarding one half, and forming on the other a lug at one end for mounting in the same way as was the original fixture. Where a clasp-nut is fitted the fixing may be to the top half of the nut by means of a couple of short set-screws. Despite the extra length the guard gives no trouble from lack of rigidity.

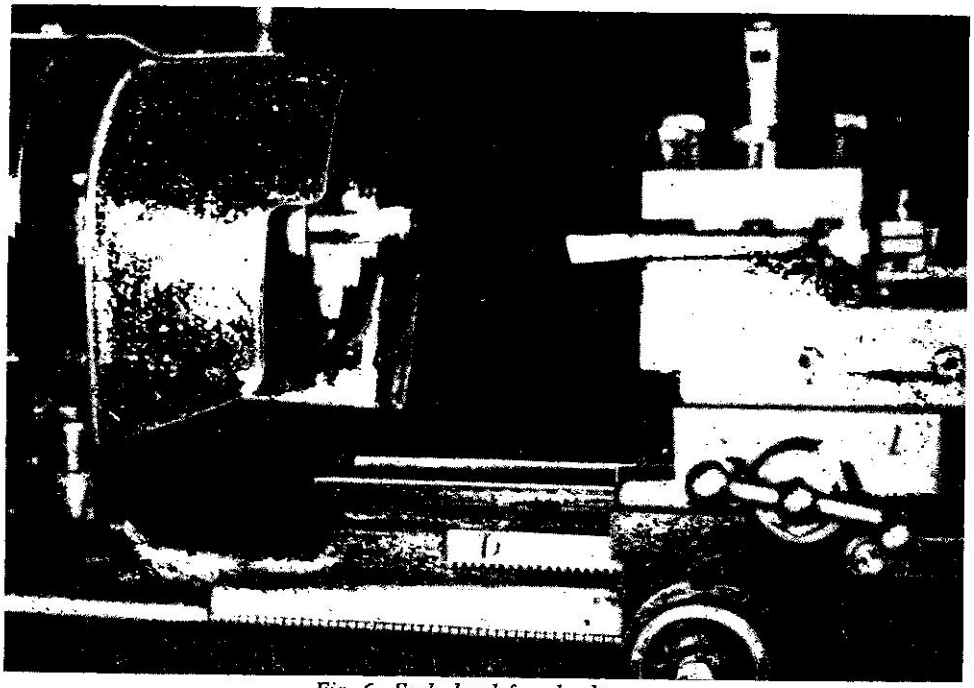


Fig. 6. Suds hood for chucks

Notwithstanding the use of a guard, the screw should be frequently and thoroughly cleaned.

(*To be continued*)

CARVING OUT A TWO-STROKE

By EDGAR T. WESTBURY

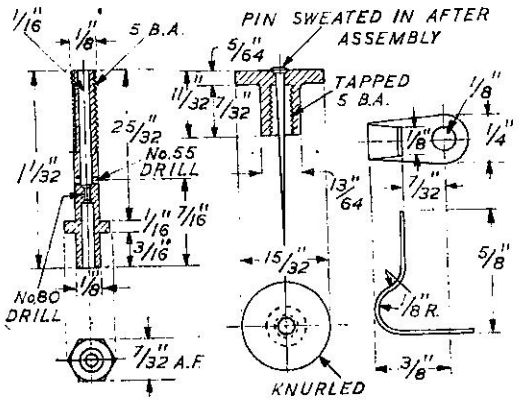
THE carburettor fitted to the "Zephyr" engine follows the same principles as that of most engines in this class, consisting simply of a jet tube with a needle-controlled orifice, placed across the throat of the air passage, which is formed integrally with the rear endplate. The fuel is fed to the jet either by suction or gravity, according to the position of the feed tank; if it were considered desirable to do so, it might also be equipped with a float chamber to provide a constant head, or be fed with fuel under pressure. But generally speaking, there is little to be gained by either of these measures, in a simple carburettor of this type; but it should be remembered that the method of feed affects the characteristics of the jet output, and that the behaviour of the engine under different load and speed conditions may be influenced by the position of the fuel tank. In my experience with small engines, I have found that a slight gravity "head" produced by elevating the tank not more than about an inch or so above the level of the jet orifice, introduces a compensating effect which is very helpful to promoting flexibility under load; but it has the disadvantage that if the engine is left standing with the orifice open, fuel may leak through and flood the engine. This could be avoided by fitting a stopcock to the tank. The more usual method of fitting the tank immediately below the jet eliminates the possibility of flooding, and may be preferred, but in the case of an engine installed in a vertical position, it brings the fuel tank right below the engine level, which may be inconvenient, especially when it is fitted in a boat.

The jet tube is reversible, so that it may be adapted to suit either upright or inverted mounting of the engine, and in the latter case, the direct attachment of the tank below the jet tube is quite convenient. In the experimental work on this engine, a small reservoir turned from a solid piece of ¾-in. duralumin bar, with a screw top to fit a flange attached to the base of the jet tube, has been used; the same idea may be applied, using the popular transparent plastic type of tank, machined or moulded from cellulose acetate, Perspex or Catalin.

In making the jet tube, a fairly tough material should be used, as this part gets rather rough usage, especially when the tank is directly attached to it. Brass screw rod is hardly good enough, bronze, German silver, or steel being better, though a little more difficult to machine. Hexagonal stock is specified for this component, but round material may be used if the collar afterwards has flats formed on the sides, for holding it while securing by means of the nut at the top.

It will generally be found best to machine the top part of the jet tube first, including the turning and screwing, and the drilling of the centre $\frac{1}{16}$-in. hole to a depth of $\frac{11}{16}$ in. A high speed is essential for accurate drilling, and a small, rigidly-mounted centre-drill should be used to ensure a true start for the drill.

A piece of scrap brass about $\frac{3}{4}$ in. long should now be held in the chuck and drilled truly through the centre, 5 B.A. tapping size (No. 39 drill), opened out to $\frac{1}{8}$ in. to a depth of $\frac{3}{8}$ in., and the rest tapped 5 B.A. This forms a chucking jig to hold the jet tube truly for machining the lower end, which is drilled $\frac{1}{16}$ in. diameter to a depth of $\frac{5}{16}$ in., and the No. 80 drill then applied to drill through the actual jet orifice. I find it best to hold the drill by means of a watchmaker's pin-chuck, and apply it with the fingers, as the normal tailstock barrel feed does not give a sufficiently sensitive "feel" for very tiny drills. If a No. 80 drill is not available, a somewhat larger one may be used, but too large an orifice makes fine control difficult, as the needle must penetrate farther into the orifice to effect the necessary restriction of jet area.



Carburettor parts

The lower end of the jet tube may be altered as required to suit the type of feed used; for instance, it may have an extension tube sweated in to reach the bottom of a "suction" tank, or may be screwed externally and coned internally to form a union joint. I recommend an all-metal fuel line wherever possible, as flexible pipes or connectors, even when made of material claimed to be petrol-resisting, are often a source of trouble. A small saddle washer should be made to fit the contour of the air passage through which

★ *Concluded from page 85, "M.E.," July 25, 1946.*

the jet tube fits, and the position of the cross holes in the tube should be arranged to come as near the centre of the air passage as possible.

A word about the function and purpose of these holes may be opportune, as I have had many queries on this subject lately. Though they may be more or less correctly defined as spray orifices, they play no decisive part in metering the fuel, and thus their exact size is not critical. But they do influence the output of the jet orifice to a certain extent, by modifying the suction which is actually communicated thereto. If the holes are very small, only a slight suction will be produced at the orifice, and the jet action will be "mild," requiring a large movement of the needle to increase or decrease mixture strength. Large holes will produce a "fierce" jet action. Sometimes a hole is drilled on one side only of the jet tube, on the side which faces the engine, and this produces the most positive action of all. I generally avoid this principle, because it necessitates keeping the jet tube the right way round, and I have encountered many cases where mysterious carburation trouble has resulted through incorrect assembly or shifting of the jet tube. The usual symptoms are that the engine behaves more or less normally while the air inlet is partially strangled, but peters out immediately it is fully opened. With the holes drilled right across the jet tube, their position relative to the line of flow is not very important.

The jet adjusting head is made of brass, knurled on the edge and screwed internally to fit the top of the jet tube. It has an ordinary brass or steel dress pin sweated in to form the jet needle. To ensure that this is in the correct position, the jet tube is first assembled in the air passage, with the friction clip and nut in position, and the head is screwed on until it is about one thread clear of the nut. The pin is then inserted, pushed down as far as it will go, and sweated in, any projecting length being cut off and finished off smooth.

The friction clip may be made from spring-steel or phosphor-bronze, bent as shown, and clamped under the jet-tube nut, the sides being bent down after assembly to locate it on the rounded surface of the air tube. A depression may be made with a centre-punch in the upper part of the clip, to form a bulge on the inner surface, which will snap into the serrations of the knurled head, and help to ensure that it is held in the set position.

No air control is fitted to this carburettor, but if desired, the air tube may be extended to take any form of shutter the constructor may prefer. Personally, I am in favour of fitting an air control, but it seems to be an unwanted refinement nowadays.

Contact-breaker

This is of a very simple type which has been evolved in the course of experiments, and used with success on several of my recent engines, with minor variation of design. Apart from its simplicity, its main virtue is that it takes very little power to drive, even at extremely high speed. Many contact-breakers put quite an abnormal amount of load on a small engine, and if any attempt is made to lighten this by reducing the strength of the spring, the result is to cause misfiring. In this contact-breaker, a short flat spring is used, having the minimum moment of inertia and an extremely high natural period. A break clearance of not more than about 0.005 in. is allowed between the contact points, and when used in conjunction with the recommended form of cam, the breaker will operate smoothly and positively at speeds up to well over 15,000 breaks per minute.

The body or bracket may be filed or machined from duralumin bar, and if it is desired to modify the form of control lever (which, as shown, is combined with the set screw securing the leaf spring), this may be allowed for in the shape or arrangement. It is bored to fit stiffly over the end of the main bearing housing, and equipped with the usual split friction clamp. The $\frac{1}{8}$-in. hole for the fibre push-rod should be reamed, and the raised boss around it may be turned externally by mounting the bracket on a pin mandrel.

It will be seen that the leaf spring is slightly waisted between the fixing hole and the contact rivet, to ensure that flexure takes place mainly at this point and not at the outer end. The rivet should be as small as possible, to avoid weakening the spring, but it should be firmly secured to provide a sound electrical contact. It may be mentioned that tungsten screws and rivets, or tips which may be silver-soldered to small screws or rivets, are obtainable from manufacturers specialising in contact materials, and I hope to be able to arrange in due course for supplies to be obtainable through the model engineering trade. The hole for the contact screw should be tapped out to take the screw a tight fit, so that it does not need locking, but should this be found impracticable, a small distance washer may be fitted under the head of the screw, so that it will clamp down firmly at the correct height to give the required contact clearance.

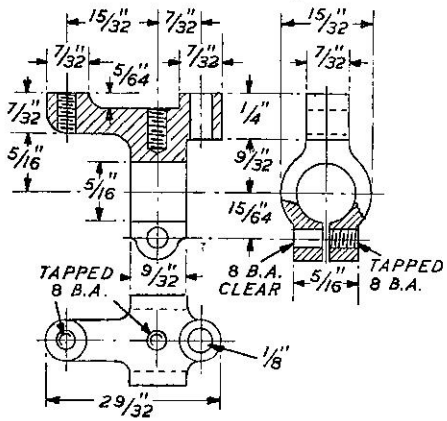
The best material for the insulating washers is either a specially fine pulp base bakelite, vulcanised fibre, or ebonite, and it may be found desirable to modify the thickness of these washers to adjust the spring position so that it is approximately level (i.e. parallel to the shaft axis) when the contacts are closed. A solder tag should be placed on top of the spring, *in contact with it*, to enable the low-tension contact to be made when the breaker is assembled. The push rod may be made of fabric-laminated bakelite, or turned down from one of the rods supplied for the same duty in face-cam type magneto contact-breakers. It should fit the hole quite easily, and may, if desired, have a thin head on the upper end, to prevent it from falling out and getting lost when the breaker assembly is removed from the engine.

As already mentioned, the turned duralumin control lever shown may be modified to suit the constructor's fancy, or a plain steel, hexagon-headed set-screw subsituted to hold the spring in place. It should be pointed out that the contact-breaker shown in the photographs is not identical with that in the detail drawings; though it is the same in principle, the spring blade is disposed at right angles to the shaft, while the type shown here has the spring parallel to the shaft, which results in a neater and more compact assembly. A particular point about the design of leaf-spring breakers in which a thrust member is interposed between the cam and the spring, is that the latter

is isolated both from frictional wear and side drag, and also to some extent protected from oil, though a completely oil-free contact-breaker is almost an impossibility, in engines which run continuously in a blue haze of oil fumes.

Assembly

This is so simple and obvious that there is little that need be said about it. A point which is of special importance in very small engines, however, is that all components should be scrupulously clean and free from swarf or abrasive material before assembly This can be assured by prolonged soaking in a paraffin bath, and syringing out of all holes, passages and crevices—a small hypodermic with a fine needle is an extremely useful tool for this job, if the possession of it does not lay one open to the suspicion of being a dope fiend!



Contact-breaker bracket

When assembling the hub and collet on the crankshaft, the cam should be set to break contact at about 30 deg. before t.d.c. when the control lever is dead upright, and this may be taken as the normal running position; though, as the bracket is capable of being turned completely round on the housing it is possible to adopt any desired position for the lever. If the fitting of the hub collet is good, there will be little risk of shifting the cam when the collet nut is screwed up, but it will be found advisable to remove the front housing and crank assembly so that the crank disc can be held in the vice (with soft jaws of course), in order to tighten the nut properly. In this process the collet may be drawn slightly away from the end of the bearing, introducing a slight end play, but this will not be harmful. An extractor may be made for the purpose of dismantling the hub, having jaws to hook over the hub flange, and a hollow screw to clear the shaft and bear on the end of the collet; or instead of the jaw type, a screw-on extractor may be used, if the end of the hub is screwed to receive it.

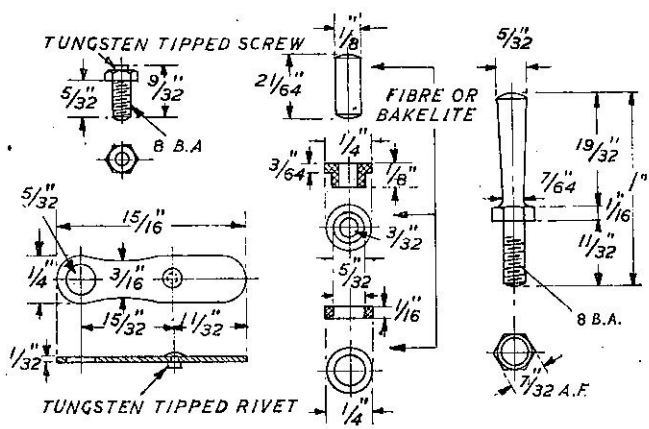
All joints should be given a smear of shellac varnish, or one of the special jointing preparations, before assembly, to prevent oil creepage—not in the hope of sealing leaks. Lock the nut on the rear housing so that the carburettor port is in its correct position; and make certain that the head, when screwed down tightly, makes contact on the inner joint face.

The "Zephyr" engine is one of the easiest engines to assemble and dismantle if one is prepared to make three simple spanners, to fit the front housing, the rear lock nut, and the cylinder head respectively. Many readers who have attended my lectures and demonstrations can testify to the fact that its essential parts may be laid open to inspection in a matter of about 35 seconds—and put together almost as quickly.

Here then, I will leave the latest and smallest addition to THE MODEL ENGINEER series of model petrol engines in the hands of readers, trusting that it will be found to fill a need, and that eventually it will prove as successful and popular as its predecessors.

Corrections and Apologies

I stand corrected by a mighty host of readers, who have informed me by letter, postcard, 'phone and good old-fashioned buttonholing, that it is impossible to cut the crankcase of the "Zephyr" engine from a 1½-in. diameter bar; the size required is 1⅝ in. This is perhaps a minor matter, as it must inevitably be found out early in the construction; but it is possible that some readers may have been caused delay or inconvenience, and to them I offer my sincere apologies. Almost before the ink was dry on the July 11th issue I received a 'phone call from a reader to point out how the "Zephyr" had grown from 2½ c.c. to 5 c.c. according to the heading of the article on that date! In this case, however, the fault is not mine, as I had nothing to do with the heading. I wouldn't dare accuse the Editor, so perhaps we had better fall back on our good old scapegoat, the printer, whose back is broad, and who only exists to take the blame for mistakes, anyhow!

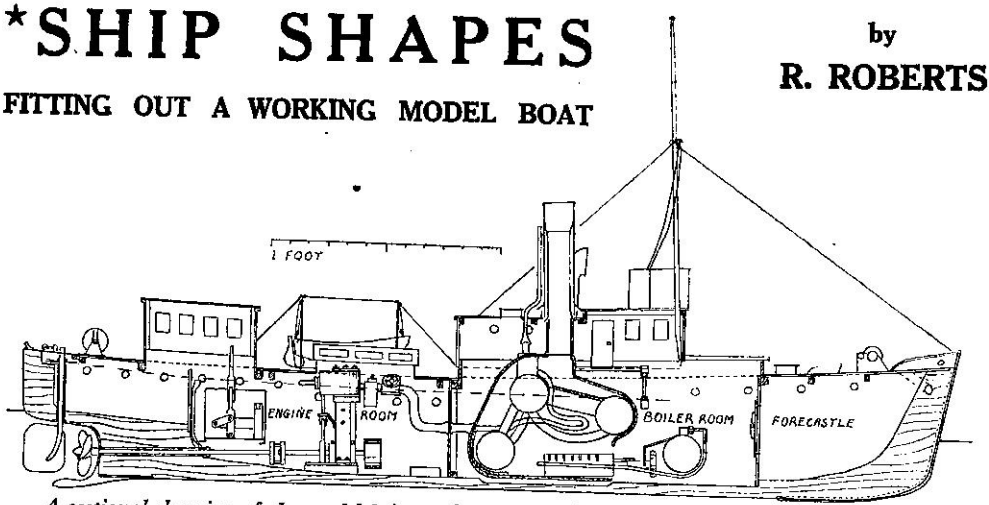


Contact-breaker parts

*SHIP SHAPES

FITTING OUT A WORKING MODEL BOAT

by
R. ROBERTS



A sectional drawing of the model ½-in. scale steam yacht "Tao," showing general layout of machinery and superstructure. The boiler feed-water tank contains the hand pump. The engine is double-acting, slide valve, ¾-in. × ¾-in. single-cylinder. The water-tube boiler is fired by a paraffin blow-lamp

A PREVIOUS article under this title is here continued with a description of how to fit out a model. Let us assume that a hull, more or less like the one of which the construction was detailed out in the February 28th last issue, has been given, say, two coats of under-paint and been found to float on an even keel.

Some of the parts may appear to be unnecessary complications to readers starting on a simple first attempt (if any working model can ever be called simple), but a fairly complete account of how to build up all the parts should be a useful guide to beginners. There are no castings to worry about, even the propeller and ventilators have been built up.

The holes for the propeller-shaft and rudder-spindle can be drilled before the hull is glued together, as it is slightly easier, though this is not very important. The correct positions are marked carefully on that all-important centre-line, and a small hole drilled first from outside the hull inwards, say ⅛ in. or 3/16 in. to start with. If it comes out O.K. well and good, you go ahead and enlarge it. If not, try again with a larger drill. Some care and a bit of luck may correct the alignment this time, but if still off centre, a round file will do the needful. Make quite sure your shafts come out at the right place. A little untidiness on the inside can always be looked after with some plastic wood.

To save needless repetition: unless otherwise stated all fittings are of brass and all screws are brass countersunk ⅜ in. long, number 1's or 2's. Every fitting in contact with the wood of the hull is smeared with red lead before finally fixing down. Red lead comes in powder form and is mixed with boiled linseed oil to a nice "gooey" consistency. Failing boiled oil, a mixture of gold size and ordinary linseed oil will do.

* *Continued from page* 213, "*M.E.*," *Vol.* 94, *February* 28, 1946.

Stern Assembly

Fig. 1 gives an idea of the layout. The holes for the propeller and rudder tubes are ⅜ in. The skeg is sawn and filed up from ¼-in. × ½-in. bar 5 in. long, fastened to the keel by ⅜-in. screws. The keel is recessed to receive the skeg and allow it to join in neatly with it. The stern plate is filed and bent up from 1/16-in. or ⅛-in. sheet; the ⅜-in. hole is a press-fit on the stern tube; it is held by two ⅜-in. screws. The tube itself is 6 in. × ⅜ in. and bushed at each end to take a ¼-in. propeller-shaft. Having no lathe at the time, I simply bent two pieces of thin sheet-brass round a ¼-in. rod and then soldered one in each end. All edges of these parts that touch each other when assembled are cleaned and tinned for sweating together later.

Rudder

Fig. 2 is a straightforward steering arrangement. The ¼-in. spindle is 5⅜ in. long. The top end is squared for ⅛ in. of its length to fit a ditto hole in the tiller. The lower end is tapered and split down lengthwise with a hacksaw for about 1¾ in. and bent to the curve, as per drawing. The rudder is cut from ⅛-in. sheet 2¾ in. × 2¼ in. The streamline section is formed by filing, and the curved groove to take the end of the spindle cut with a file and/or chisel. Rudder and spindle are riveted and soldered together permanently, then polished with emery cloth.

The tiller can be either a push-fit on the spindle or held by a washer and screw. Alternatively the spindle may be left ⅛ in. longer and rounded off to take a ⅛-in. × 40 nut to hold the tiller. The after end of the tiller is slotted ⅛ in. wide by 3/16 in. deep to take the ⅛-in. thick adjusting nut. The nut is tapped ⅛ in. by 40 to fit the quadrant, made from a length of ⅛-in. rod. When this is threaded to fit the nut and annealed, it can be bent in the fingers to a radius that will just clear the end of the tiller. The quadrant is held

in position by being soldered into holes in the top ends of the little pillars $\frac{3}{16}$ in. × $\frac{3}{16}$ in., fixed to the deck as shown, or riveted and soldered to the cover-plate (Fig. 3) if this component is used. When cutting the thread on the quadrant a little experimenting will be needed, as the nut must *not* be a sloppy fit in use, but the die must be adjusted to cut the thread small enough to allow for bending to the radius.

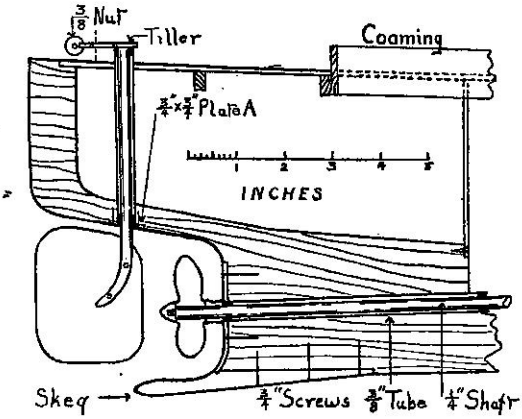


Fig. 1

The rudder-spindle tube can be either pushed into its hole until it rests on the little plate "A," or bushed (see propeller tube) and soldered into a $\frac{3}{8}$-in. hole in plate "A." This plate is drilled $\frac{1}{4}$ in. in the middle and for four small screws in each corner; then sunk in flush with the bottom.

Steering Gear

Figs. 3 and 4 give plan and elevations of a more complicated arrangement, embodying that just described plus means of connecting it up to a wheel on the bridge. The gear can be used instead of the tiller, which is taken off when not wanted. It comprises a collar "A," to stop the spindle dropping; "B," a toothed-wheel or quadrant, loose on the spindle, but connected to it by the spring wire "C," the wheel engaging with the worm "D," which is fixed to one end of the shaft "E." This shaft runs forward along one side of the boat to a level with the bridge. It has in it two universal joints and is supported by four simple bearings.

The photograph shows the box of tricks with the cover-plate (forming part of the deck) removed. The means of throwing the gear out of use is done through the lever "F" (lying in position on top of the worm in the photograph). This is connected to a hand-lever on deck through a short shaft, also in the photograph, with its

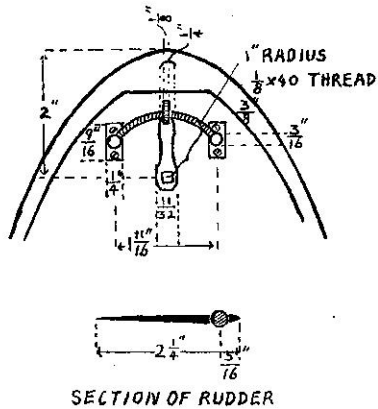


Fig. 2

bearing in the cover-plate. The after end of lever "F" is bent down and forked to embrace the worm-shaft. The worm is allowed to move sideways in slotted bearings so that it can be moved in and out of mesh with the toothed wheel. When out of mesh the wheel is free to move with the rudder-spindle. This sounds complicated, but is really quite straightforward to fix up, and is rather fascinating in action.

The rudder tube is cut $\frac{3}{4}$ in. shorter and the top end of it held firm by a plate screwed to a shelf carved in the hull (see diagram). This shelf also has the slotted bearing for the worm-shaft screwed to it. This bearing is a piece of $\frac{1}{16}$-in. sheet $1\frac{3}{8}$ in. long by $\frac{3}{8}$ in. wide; $\frac{5}{16}$ in. of each end is bent up at right-angles, the centre part drilled for two screw holes and the ends slotted in their sides.

The spindle has a 3/64-in. hole drilled through it 17/32 in. from the top for a length of piano

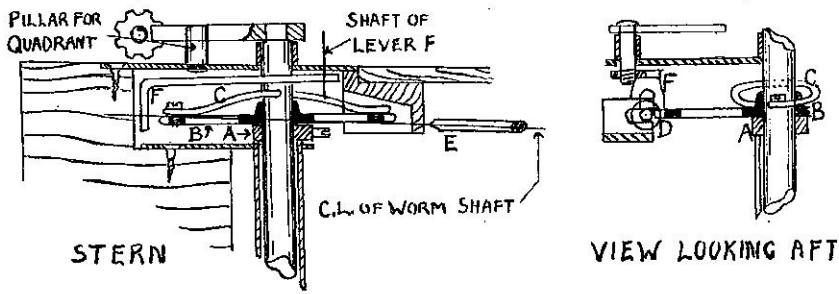


Fig. 3

wire. Each end of this is fastened to the wheel by a large-headed screw or bent down to engage holes drilled in the rim of the wheel. The object of the spring is, of course, to absorb shocks to the rudder that might break the teeth of the gear. This wire should be about 18 or 20 s.w.g. and must be slightly in tension to prevent any sloppiness or backlash at this point. If the rudder is able to move even a small amount on its own the boat will be almost impossible to steer with any accuracy.

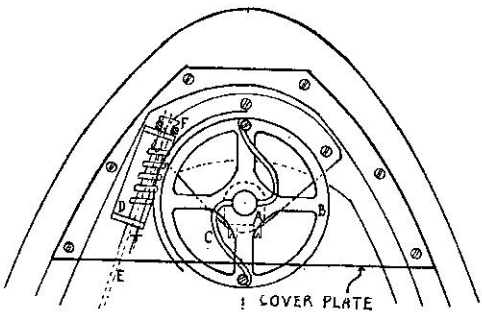


Fig. 4

The toothed-wheel was taken from one of those excellent old wall clocks, rescued from a junk-heap, a useful source of gears for those unequipped to cut their own. Actually a quadrant with teeth to cover only 90 deg. is ample, as the full helm on a model is seldom if ever used, even less than this is sufficient in everyday practice.

The collar was made with two grub-screws, this being considered less likely to work loose than with one only.

Again no lathe for the worm; so recourse was made to winding as accurately as possible a piece of 16-gauge wire round a 2-in. nail and soldering them together. This was trued up with a small flat file. The teeth on the wheel were filed to the same slope as the worm pitch, and a round file cut the ends of the teeth concave to fit the worm. While the above methods are by no means to the usual MODEL ENGINEER standards of accuracy—it works—and satisfactorily.

The two universal joints (Fig. 5) were sawn and filed from $\frac{1}{8}$-in. sheet, being $\frac{1}{8}$ in. × $\frac{1}{8}$ in. in section. They have $\frac{1}{16}$-in. steel pins riveted and

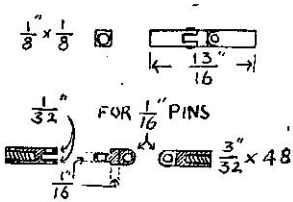


Fig. 5

are screwed tightly on to the ends of their respective shafts.

Complete dimensions have not been given, as prospective builders will have different material to work from, but the scheme can be copied from the drawings.

The Bow

The bow (Fig. 6) is fitted with an inlaid stem or cutwater made from brass strip $\frac{1}{8}$ in. × $\frac{1}{4}$ in. × 15$\frac{1}{2}$ in. long. This is annealed for 5 in. or so in the middle and carefully bent to the curve of the foot of the bow where cutwater becomes keel. Because of the bending it is easier to make it in two pieces with a butt joint at the apex of the bend. A groove is cut in the wood to allow the strip to bed in half its thickness. (See drawing.) A small chisel is required for the job. If one is not to hand it is well worth making, as it will come in useful later on. Take any piece of tool-steel 4 in. to 6 in. long; an old round file will do. Heat up one end and hammer until it is 3/32 in. square. Don't make the metal too hot—bright red—so that it forms scale, and don't go on bashing when the redness has died away or it will crack. File a bevel on the end and temper to a light or medium straw colour. Hold the chisel in a vice blunt end up and bang on a piece of rounded wood for a handle—easy, isn't it? Sharpen the little chisel on an oil-stone. The total time may be twenty minutes—well spent.

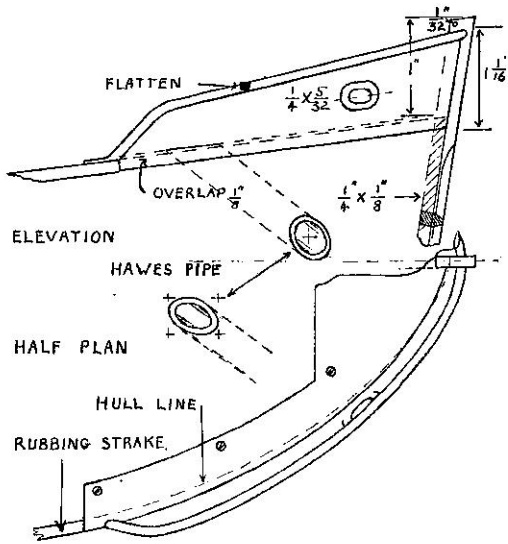
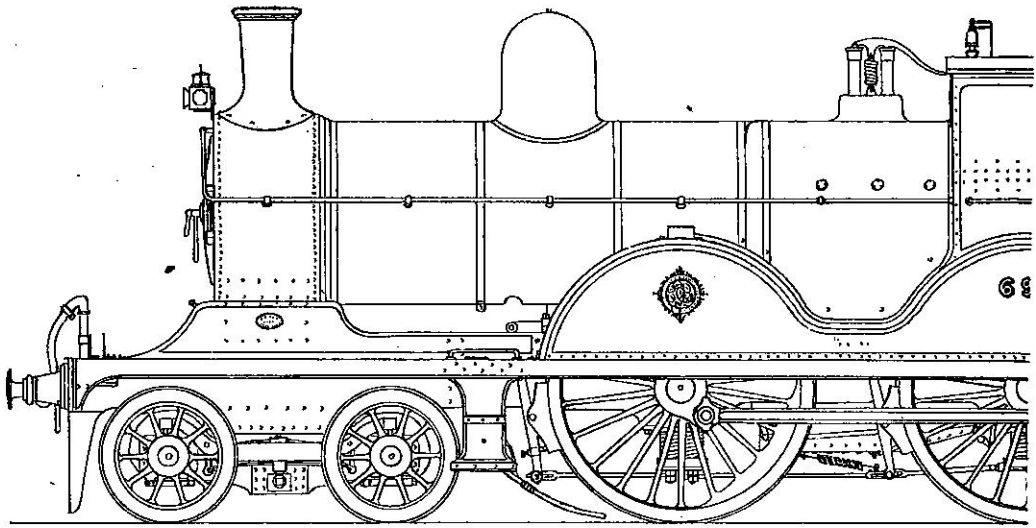


Fig. 6

Use the chisel held in the hands for cutting the groove with two pencil lines as a guide. This metal stem is important as it protects the end grain of the wood which otherwise is easily damaged. The strip is bevelled as shown in the drawing and has a $\frac{1}{8}$-in. hole $\frac{1}{4}$ in. from its top end with a 1/32-in. hole in the corner just above it to attach the forestay of the mast. The bottom end is soldered to a plate $\frac{3}{4}$ in. × $\frac{3}{8}$ in. flush-fitted and held by two screws.

The top assembly can be left out, in which case cut the stem $\frac{7}{8}$ in. shorter. Otherwise it consists of: a plate lying flat on the deck and overlapping

(*Continued on page* 137)

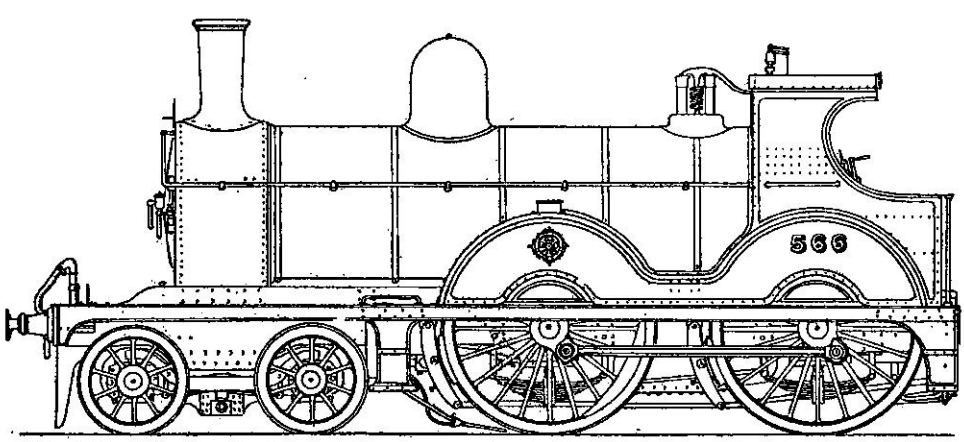


LOCOMOTIVES WORTH MO

No. 16—M.S. &

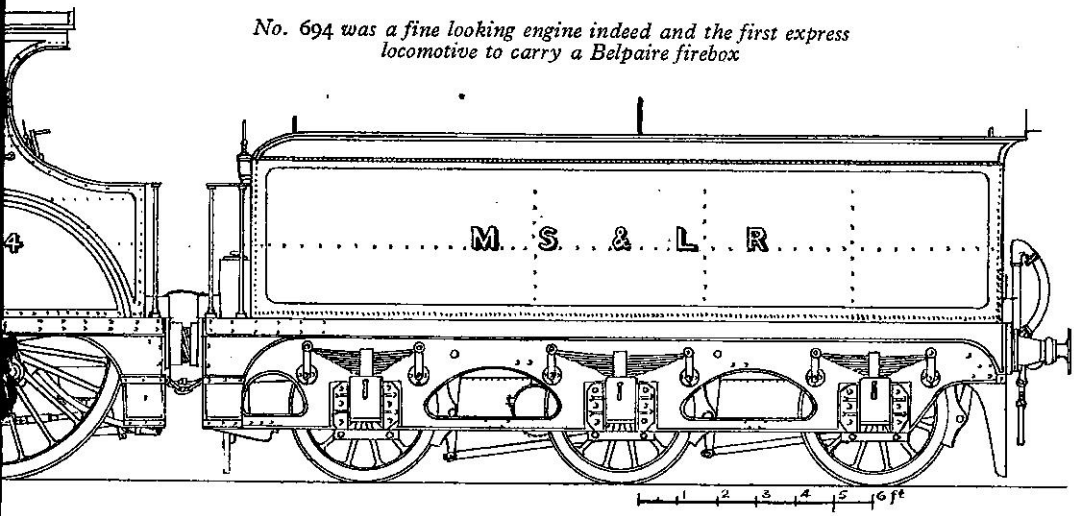
THE Manchester, Sheffield and Lincolnshire Railway was a company known only as a name to those who were stay-at-homes in London. But the day came when the great extension to the Metropolis was completed, and we were able to have the unusual experience of visiting a brand new London terminus! How very fine this clean and rather silent station appeared. How different from the smoke, bustle and noise of Liverpool Street, or the characteristic sounds—and smells—of, say, our old haunt of Paddington! But one glance at the engines entering Marylebone—that is, when they *did* enter (which was all too seldom) revealed the fact that the newcomers were well worth any hours of waiting that we had had to undergo.

Lovely green four-four-noughts we called them, and we were right. They were lovely green engines. As first acquaintance developed into deeper friendship we became aware that there were at least three classes, although at first sight they closely resembled each other. Presently we were able to photograph each type, and also to sort out their numbers. The smallest lot comprised thirty-one engines, Nos. 562-567 (built in 1890), 682-686 (1891), 687 (1892), 688-693 (1894),



The M.S. & L. Ry. Parker engines were most pleasing in proportions and typical of their day

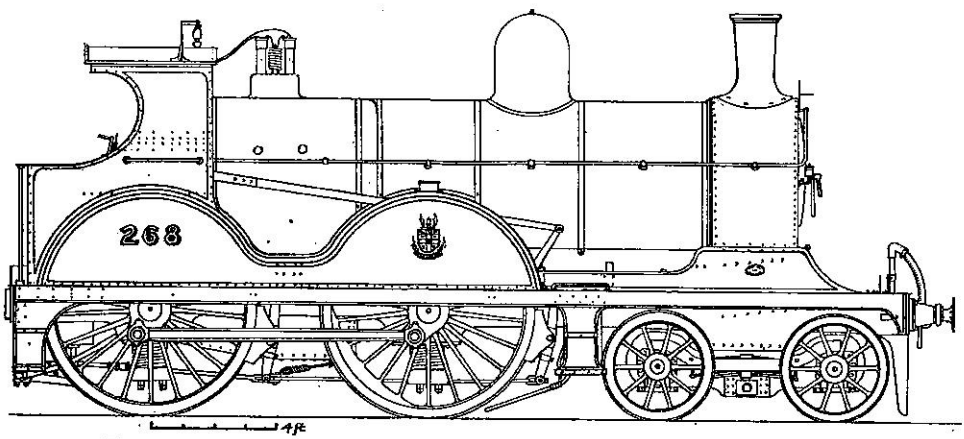
No. 694 was a fine looking engine indeed and the first express locomotive to carry a Belpaire firebox



DELLING by F. C. Hambleton

L. Railway, No. 694

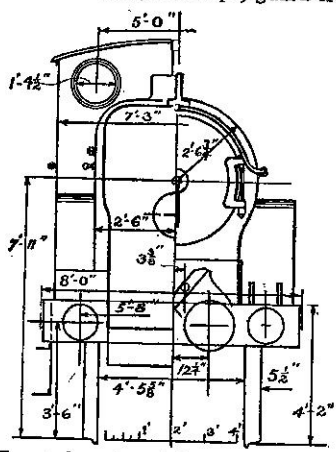
and 700-711 (1892). They were all built at the company's works at Gorton, excepting 700-711. These had been constructed by Messrs. Kitson, who had also turned out the very first one, No. 561, in readiness for the Manchester Exhibition of 1887, being shown there as a joint Kitson-M.S.L.R. exhibit. In a few unimportant details she differed from No. 562, which appeared three years later. The chief at Gorton at this period was the able Thomas Parker, who had succeeded Mr. Sacré, of single-wheeler fame. The design was a typical English 4-4-0 of the day, neat and efficient, and a delight to the eye. It strongly recalled such pleasant engines as the early Aspinall L. & Ys. and the William Kirtley black beauties of the London, Chatham and Dover line. They had cylinders 18 by 26 in. ; wheels 6 ft. 9 in. and 3 ft. 6 in., spread over a wheelbase of 21 ft. 9 in. ; 5 ft. 9 in. (bogie), 8 ft. 7 in. (drivers). The boiler was 10 ft. 8 in. long, with a mean diameter inside of 4 ft. 2 in. pitched with its centre-line 7 ft. 4½ in. above the rails. The grate area was 18.85 sq. ft., pressure 160 lb., and they turned the scale at 46 tons. When new the exhibition engine had had bright tyres, a brass beading to the splashers, and a number-plate not unlike the



These splendid Pollitt engines had 8-in. piston valves placed below the cylinders

Drummond pattern with black waxed figures.

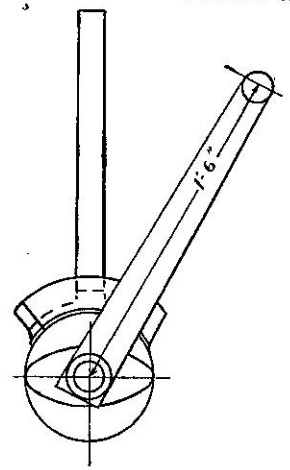
Nice as these engines were we found a larger edition of them yet more attractive. These proved to be six engines built in 1895, although they had been planned two years earlier by Mr. Parker. However, he had retired from his post in December, 1893, and his successor, Mr. Harry Pollitt introduced into Nos. 694-699 some touches of his own. For one thing, he raised up the boiler until it stood no less than 7 ft. 11 in. above rail level, which was high indeed for those days. It gave the engines a wonderful appearance, which was enhanced by the position of the chimney, which was placed 3 in. in advance of the centre of the bogie. The colour scheme was also most attractive; a fine middle-green, edged with a black border, and separated from it by fine yellow lines. The edge of the dome likewise carried a black band and yellow lines, whilst the black headlamps had quaint little side panels of yellow. The frames, footsteps, guard-irons, and



Front elevation of 694 showing Vee-shaped steam chest and section through Belpaire firebox

buffer sockets were light brown edged with yellow lines, the numerals and initials being gilt shaded with red. The brass bands around the splashers, bright tyres and the chimney with its wide sweeping base and triple moulding at the top supplied the finishing touches. What a harmonious picture! Turning from good looks to interesting technical features it is worth recording that they were the first express engines to carry a Belpaire firebox, and that the slide valves, inclined at 1 in 10, worked on V-faces, much as in the L.N.W.R. *Precedent* class. The cranks were hooped, elliptical in outline and provided with a bolt passing through the crank-pin. The connecting-rods were 6 ft. 6 in. between centres, and the Stephenson gear was quite solidly planned.

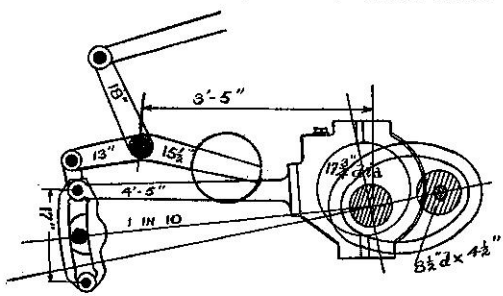
The screw reversing handle was on the right-hand side of the cab, and resembled the Adams L.S.W.R. pattern, except that it had two handles. Two water-gauges were illuminated at night by a small lamp placed between them, whilst a second lamp, mounted on a tall iron situated directly behind the regulator shone its dim rays on to the steam and vacuum brake gauges. This was an unusual feature, and just at first we mistook this tall lamp-iron for some kind of mysterious second regulator handle! Not many engines could boast of two cab lamps; Stroudley's *Gladstones* had the same luxurious feature. A



Regulator handle, gland and lamp-iron of the 694 class

large curved rectangular shield covered the fire-door, and the two whistles, vacuum ejector and sight-feed lubricators were supplied from a steam fountain. The layout of the cab was very well planned and bore a strong resemblance to the L.S.W.R. engines. These fine fellows, when new, ran the best trains between Sheffield and Grantham, and in due course were frequent visitors to London. How stately they looked as their large 7-ft. driving wheels went swinging round at high speed!

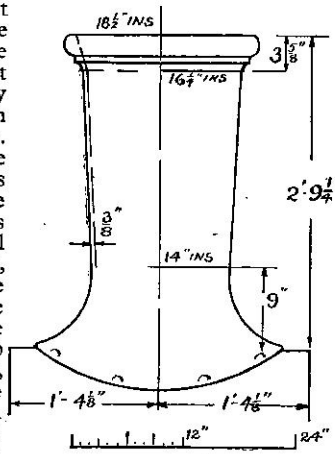
The third type was a piston-valve edition of these grand engines. There were thirty-three of them: 268 (1897), 269, 270 and 852-861 (1898) and Beyer, Peacock's 862-881, also built in 1898. One could spot them by their cab sheets which



General layout of Stephenson valve-gear on 694

were built higher—indeed level with the hand-rails—and by their bigger tenders with 4 ft. 3 in. wheels as against the 3 ft. 9 in. ones belonging to the 694 class. They also had lubricators attached to the front plate of the smokebox—a feature shared by the 561's, and later on by the big

single-wheeler 967 class, but not by the 694 class. These piston-valve engines had the honour of running the first trains at the opening ceremony of the London extension on March 9th, 1899, and thus Nos. 861, 268, 269 and 270 were specially decorated with flags for the great occasion. The company had now changed its name to that of "Great Central Railway," and the new shield, and motto "Forward," were henceforth displayed on the driving-wheel splashers. These engines, suitably brought up to date with Robinson boilers, chimneys and superheaters, have had a long life, some putting in more than forty years' service! Fine engines, indeed, and *so* good to look at—and isn't that enough to commend them to you, good locomodeller?



The Parker chimney was a heavy casting with a sharp taper at the extreme top

Principal dimensions of the M.S.L. Railway 694 class :—

Wheels, 7 ft. 0 in., and 3 ft. 6 in. Cylinders, 18½ by 26 in.

Ports, 1½ and 3¼ by 16 in. Lap of valves, 1 in. Lead, 5/32 in. Travel 4 $\frac{8}{16}$ in. Throw of ecccentrics, 6½ in.

Diameter of sheaves, 17¾ in. by 2⅝ in. width.

Diameter of piston-rods, 3⅝ in. Crank-pins, 8½ by 4½ in.

Axle wheel-seats: diameter, 6½ and 8¾ by 6 $\frac{8}{16}$ and 7 $\frac{8}{16}$ in.

Steel frames, 1 $\frac{1}{16}$ in. thick, and 3 ft. 11½ in. between.

Front of frame to centre of bogie, 5 ft. 3½ in.

Bogie centres, 5 ft 9 in. Coupled centres, 9 ft. 0 in. Total wheelbase, 22 ft. 2 in. Engine and tender wheelbase, 44 ft. 5 in.

Length over buffers, 53 ft. 7¾ in. Throw of coupling-rods, 11 in. Centres of coupling-rods, 6 ft. 2½ in.

Boiler clothing, 4 ft. 9⅞ in. diameter. Length of barrel, 11 ft. 0½ in. Length of Belpaire firebox, 6 ft. 4 in.

Pressure, 170 lb. Wheelbase of tender, 13 ft. 0 in.

Widths (outside of firebox), top, 4 ft. 6¼ in., bottom, 4 ft. 1 in.

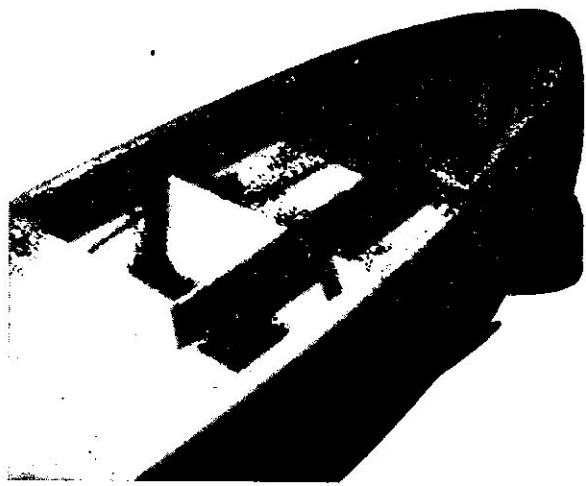
Blast-pipe, 4 $\frac{7}{16}$ in. Total weight of engine and tender, 82 tons 2 cwt.

Ship Shapes

(*Continued from page* 133)

it by about $\frac{1}{16}$ in., a rail made of $\frac{1}{8}$-in. wire passing through the hole in the stem, and two side-sheets to fill in between rail and deck-plates. This "rail" is only about 20 in. high full size; the rail proper will be described later on.

The sheets are about 26-gauge material. That on the deck is cut to outline and screwed temporarily in place. The rail is bent so that seen in plan it overlaps the deck outline, and as viewed bows on, continues the line of the sides or flare. When the wire is correctly curved it should meet the deck-plate 3¼ in. aft of the stem. Solder in place and flatten the top and outside with a file. The side-sheets are marked with a scriber by holding the material close against rail and deck-plate; they overlap the plate to meet the sides about ⅛ in. below. They have an oval hole cut in each, and pieces of wire, fitted and soldered in place for mooring-rope fair leads. Finally, they are soldered to plate, stem and wire. The screws are taken out and the whole thing should lift off as a unit while the red lead is put on before final fixing down. The hawse-pipe will be described in a later issue after the deck is on.

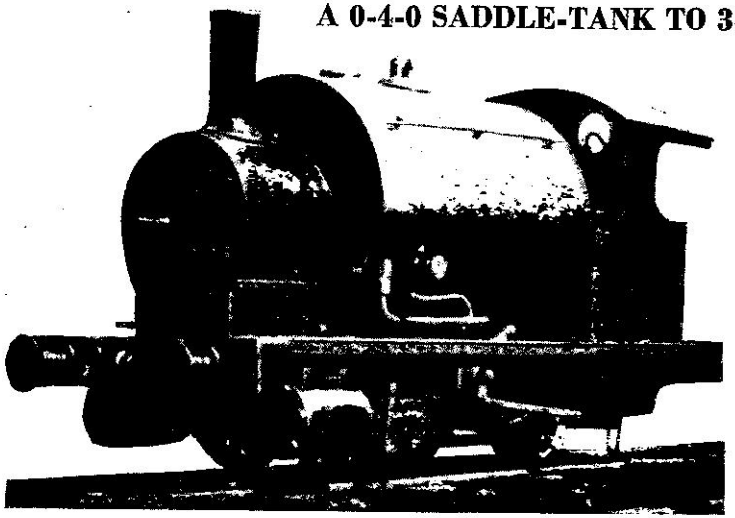


A view of the after part of the boat under construction. The worm-gear and disengaging lever can just be made out. A universal joint is just out of sight behind the bulk-head. The deck beams are integral with the hatch coamings

(*To be continued*)

"DOODLE BUG" by Hugh Duckworth

A 0-4-0 SADDLE-TANK TO 3½-in. GAUGE



HAVING a very soft spot for saddle-tank locomotives, I was vastly interested when a new one came to the works where I am employed, and close investigation revealed possibilities for modelling. To the astonishment of the driver, I went over the engine with a 2-ft. rule, and there were many discussions amongst the crew as to my intentions.

Most of the Wigan boys know my peculiarities, one of them being to make a model and then draw it afterwards, the new one being no exception. So I got busy on the frames. These are ⅛-in. × 2¼-in. × 19-in. blue steel, and the horn-blocks are cut out of $\frac{5}{16}$-in. plate, secured with rivets made from nails. Buffers were turned from scrap bolts; hooks from $\frac{3}{16}$-in. mild-steel plate. The wheels, of 2¾ in. diameter, were purchased before the war. Incidentally, these were the only castings used in the engine. Cylinders were made from scrap ends of 2 in. dia. phosphor-bronze rod. These were bored off centre to 1 in., and two flats at right-angles chipped and filed, these being the bolting and port faces respectively. The ports were end-milled *à la* "L.B.S.C." and are ⅛ in. × 4 in. × ⅝ in. Piston-rods are rustless steel and valve-rods are Sifbronze welding wire, and here I must digress.

I had got a fair way on with the model when it struck me that my pals had no idea I was making another engine, and in a spirit of mischief I kept it secret, though I think Messrs. Waterhouse and Noble smelt a rat.

The valve-gear is Walschaerts and of simple design; boiler dimensions work out to "L.B.S.C.'s" "Jumbo"; boiler was riveted and "Easyflowed." This stuff is the model engineer's dream come true. The saddle-tank is of brass from an old 4.7 shell-case, cab and footboards of 18-gauge steel plate. Pump ⅜ in. × ⅝ in., bronze ram. The axle-boxes were sprung from underneath, but after trials on the road the springs were taken off and put on top of the boxes. A mechanical oil-pump is fitted. All boiler fittings are home-made excepting pressure gauge; a pin-type regulator is fitted, but will be replaced by a disc-type.

Owing to the large cylinders and small wheels the engine is very powerful and surprisingly fast, whilst the boiler is an excellent steamer. At her

(*Continued on page* 142)

"Doodle Bug" in action

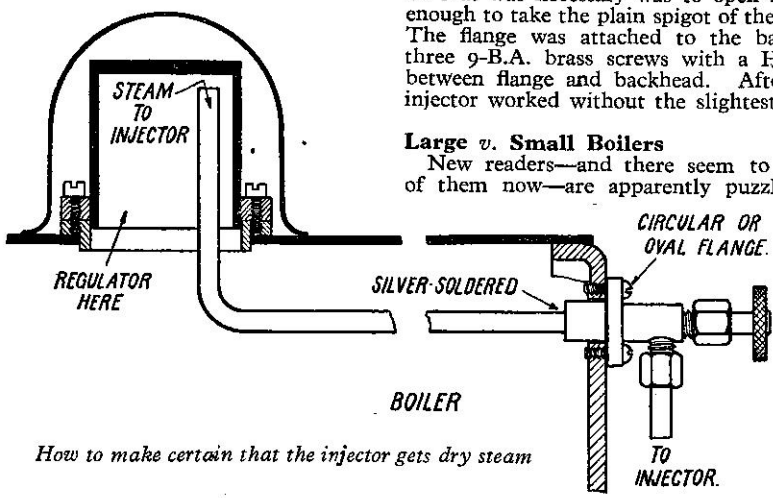
"L.B.S.C."

LOBBY CHAT—DRY STEAM WANTED

WHILST I am getting out some more details and drawings for "Hielan' Lassie," let's have another five minutes in the lobby with a few correspondents. A reader who built a 3½-in. gauge engine with a small boiler, sent dimensions of it and wanted to know if I thought it would stand fitting an injector which could be used whilst running. As the boiler was a little larger than that specified in these notes for a 2½-in. gauge engine of the 4-6-0 or 4-6-2 pattern, and they have no trouble in working with an injector feed, I told our friend to go ahead and fit an injector, with the dimensions and cones as specified for a normal 2½-in. gauge job. He did so, and duly reported that the injector would not feed, but blew all the water out of the overflow. I told him where to look for trouble, and he carried out my recommendations; still no good, so I asked to see the injector. It was very well made, and only wanted one minor adjustment, so I rigged it up on old "Ayesha" and ran her a couple of miles, using the injector only; it worked without the slightest trouble, needing no water regulation between blowing-off and about 45 lb., and would work right down to 20 lb. by regulating the water valve. It also started readily at anything above 30 lb., so I sent it back as O.K.

Greatly to my surprise, I received another letter from our friend, saying the trouble still persisted, as bad as ever, so I asked for a diagram of the pipe connections, and diameter and length of pipes. These also were all in order; so the failure was narrowed down to two causes, viz., either the feedwater was too warm to condense the steam, or else water was going over with the steam and blowing out of the steam cone. The latter proved to be the case. The backhead being small, the steam valve, which was of the usual screwdown type, which I have often described, had been screwed in close to the regulator flange, and the outlet was only a shade higher up the boiler than the regulator spindle. As the water was only about ¼ in. below the spindle when the gauge indicated half-glass, and the owner of the engine was always careful never to let it drop much below that if he could avoid it, water was priming over freely into the injector steam pipe; and as the action of an injector depends on the condensation of a jet of steam in cold water, and water coming from the steam cone won't condense any more, being water already, the trouble was explained. Any good folk experiencing injector trouble, may take a tip from the foregoing.

The trouble was easily remedied. The engine, like most of the small-boilered variety, has a good big dome; so I advised our friend to fit an internal steam pipe leading to the upper part of the dome. There was room enough for a 5/32-in. pipe without running foul of the sliding regulator valve. Obviously, he could not screw in the valve with the pipe attached to it, so I told him to make a new valve, with a circular flange, or screw a flange on to his old valve. He did the former, for the sake of neatness. The hole in the boiler backhead was not bushed, the plate being ⅜ in. in thickness, so all that was necessary was to open it out large enough to take the plain spigot of the new valve. The flange was attached to the backhead by three 9-B.A. brass screws with a Hallite joint between flange and backhead. After that the injector worked without the slightest trouble.



How to make certain that the injector gets dry steam

Large *v.* Small Boilers

New readers—and there seem to be plenty of them now—are apparently puzzled by the fact that when I describe an old-time engine, and specify the small "period" boiler, there is never any difficulty in maintaining a full head of steam. Several who built "Rainhill" as a first attempt, have been astounded at the way her tiny boiler steams; and more than one comment has been made, that the little boilers completely lick much larger ones they have seen

on club and exhibition tracks. They want to know if there is any hidden secret or mystery about it, seeing that the old advice was always to put the biggest possible boiler on the chassis if you wanted the engine to be a success.

Well, you can't always judge by appearances! For example, in our old munition shop

There was a young lady named Hilda,
The big capstan lathe simply thrilda;
She worked it with skill
Though she looked pale and ill—
You'd have thought such a job would have kilda!

Yet Hilda's output—and, incidentally, her bonus—was among the highest in the shop, and nothing would induce her to come off the big machine. One day the welfare worker called, and it so happened that on that particular day Hilda, who concentrated on her work rather than on her personal appearance when in the shop (she "made up" for it, in more senses than one, when "off duty!") looked just about washed out, in a manner of speaking. The welfare worker asked if I didn't think the machine was too much for such a frail-looking girl to handle. I said, "Well, Mrs. Blank, she can come off it if you think it advisable. Go and have a word with her." Mrs. Blank did, and came back to the office looking rather red; she exchanged a few "commonplaces," wished me good-day, and took her departure. She was a motherly soul, with the best of intentions, but somehow the girls didn't like her, saying we didn't need any "old quiz" calling in. As a matter of fact, we didn't! I have always been unconventional and unorthodox, right from the cradle; and when I took charge of the shop, put my knowledge of human physiology and human nature into practice right away. Every girl had a seat, and if she stopped her machine and sat down, nothing was said; there was a cup of tea ready any time for any girl who wanted it; if one felt ill, or unable to carry on from any cause, she had only to say the word, and the boy who drove the little delivery-van would take her home on my "tin lizzie" if she didn't feel like walking, and there was no obligation to come back until quite fit. Consequently, we had no slacking, "absenteeism" or labour trouble of any kind. The stores girl, whom we nicknamed the "sergeant-major" (she talked exactly like Tommy Handley's "Miss Hotchkiss") had done a bit of nursing and could deal with any emergencies. I never knew exactly what passed between Hilda and Mrs. Blank, but when she had gone, there were several bursts of laughter down the shop, and next time I passed Hilda's big capstan that worthy grinned and made a sign that was certainly not masonic—so I let it go at that!

Anyway, getting back to boilers, the steam-generating counterpart of the heroine of the above reminiscence can often put up a performance just as surprising; and there is no secret or mystery about it. It is simply a matter of proportioning the heating-surface to the amount of water carried, so that the water is maintained at a temperature hot enough to produce the steam required. In the old days on the L.B. & S.C. Ry., we found that some of the engines steamed more freely when the water was only halfway up the gauge glass, than when full. Sometimes it was the coal; inferior coal would not produce enough "therms" to keep a full pot boiling, but it would keep a lesser quantity at the right heat, and when both driver and fireman knew their job, the running was not affected in any way. When steam is taken from a boiler, the temperature tends to fall; it is the job of the fire to maintain it. When the rush of outgoing steam lowers the temperature at a higher rate than the fire is able to counteract, then either the coal is bad, or the boiler is too small. Not a very scientific way of explaining matters, I freely admit; but beginners and other puzzled persons will be able to get my meaning. Once a boiler is "boss of the cylinders"—that is, able to maintain its working temperature when the cylinders are taking all they possibly can from it—there is very little need to fit a larger boiler; the only advantage of same is that it is more stable, containing a larger volume of water, and consequently not so liable to temperature (and, therefore, pressure) fluctuation. Also, the larger grate can obtain the necessary "therms" for the steam required, when the coal is of poor quality, as there is more coal alight at the same time, than in the firebox of the smaller boiler.

People who put engines on paper instead of on the track, fall into the error that an outsize in grates is an advantage. Nothing is farther from the truth. To prove this, I once built a 2½-in. gauge Atlantic boiler with a barrel 3¼ in. diameter and a huge firebox with a grate 5 in. long and 4 in. wide; 20 sq. in. of grate area. It was a comparative failure, for the simple reason that the blast from a normal pair of cylinders was not strong enough to draw sufficient air through such a large grate, to ensure proper combustion of the fuel. The fire burnt patchy, and the boiler barely made enough steam to keep the engine going. It could not attain proper working temperature with a dull fire. On the other hand, old "Ayesha" with the *same size cylinders*, a boiler 3⅛ in. diameter, and a grate only 3 in. by 3 in, less than half of the one previously mentioned, will work up from 30 lb. to blowing-off whilst running, and will keep blowing-off sky-high if the firehole-door isn't opened a little. The grate has to be proportioned to the tube area, and the amount of draught available. Given the right proportions, any boiler will do its job without trouble.

Talking of "Ayesha," I was testing a friend's injector on her on one evening some time ago, when Mr. Fred Stone and his wife called, as they happened to be passing close by. After finishing the test, I asked Mr. Stone if he would like to run the fire out, so he and Mrs. Stone got aboard the flat car and set off. The old dame did sixteen laps without the fire being touched any more—about ¾ mile—and then had plenty of steam left to run several laps light engine. Twenty-five years old, no repairs to cylinders and motion, and can still give a good account of herself! I know of some older veterans, but they have had any amount of alterations, amendments, and maintenance repairs like the Scottie's knife with new handles and blades; and they are all far bigger than the

shabby little handful of mechanism which made history at the Caxton Hall, by doing the "impossible."

Get this Straight!

Another reader tells a sorry tale of woe concerning frame assembly. Reading in my instructions that angles attached to the buffer beams could be dispensed with by simply jamming the ends of the frame plates into the slots, and brazing up the lot solid, as the frames need not be taken apart any more, he proceeded to do this, and is upset because he has made a sorry mess of the job. He says he duly jammed the frames tightly into the beam slots, set the assembly true on his lathe bed as per "words and music," and got busy with his blowlamp; but as soon as the job became hot enough to melt the brazing strip, not only did the frames go all shapes, but slipped in the slots, and he has to do the whole job again. I'm truly sorry, brother, but surely you know that application of heat causes metal to expand? Our friend's sole trouble was that he didn't take precautions against anything shifting. I always erect my frames now, by the aid of my blowpipe and a bit of Sifbronze, and never have any trouble; just done "Jeanie Deans's" tender frames at time of writing. All I did to keep the assembly O.K. was to put a piece of hardwood between them in the middle of their length, and a big cramp over the lot; that held them parallel, and at the right distance apart. To keep the beams in close contact with the ends of the frames, I made a long bolt out of a bit of $\frac{3}{16}$-in. round steel, and put it through the drawbar holes in the two beams, with nuts and washers outside. It just missed the wood packing-block. As the oxy-acetylene blowpipe puts the heat only where you want it, and steel is a bad conductor of heat, the frames became merely warm at the place where the wood block was located. Each corner took only a couple of minutes; a dab of wet flux, application of the blowpipe with 150 tip in it, a couple of blobs of Sifbronze No. 1 (one each side of the frame plate) and the trick was done, with a nice fillet in each corner.

If a blowlamp is used, the whole buffer beam would become red-hot, also part of the frame, so wood packing could not be used; in that case, metal would be needed, the most convenient being a bit of iron pipe, or an iron pipe socket. The ends could be skimmed off in the lathe, so as to make certain they are square. Suitable clamps of any jaw-span can easily be improvised with bits of iron bar and coach bolts; and both spacers and clamps come in useful for subsequent jobs, so the time spent in making them is not wasted. Although experienced blowpipe artists can make many joints without distorting the articles being operated on, it is always advisable for the inexperienced worker to make certain he has the job well fixed up, so that it cannot shift by virtue of expansion stresses when heat is applied.

The Truth about "Lead" on a Valve

As the idea and purpose of "lead" on the valve (piston or slide) seems to fog the uninitiated and various folk's pronouncements only make confusion worse confounded, so to speak, let's settle the matter once and for all *from my actual personal experience*; then, perhaps, I won't get letters from beginners and other folk, wanting to argue the pros and cons. The idea of lead in a little locomotive, is NOT to cushion the piston; pistons weighing an ounce or a fraction thereof, don't need any cushioning, and even if they did, the compression portion of the stroke would see to that part of the business. The idea of lead is just this. Everything in this benighted world takes time, and it requires a certain amount of time, though only a fraction of a second, to build up full pressure on the piston head, so that the maximum thrust can take place directly the crank is in the position to transmit power; that is, the instant the crank has passed dead centre. It should be obvious even to that famous old-time music-hall character, Billy Muggins, that to achieve the above result you must start to open the port *before* the crank gets to dead centre; the exact amount depends on the size of the ports and the type of valve gear. If the port is not opened until the crank is actually on dead centre, or even after (due to what is miscalled "negative lead," but is really valve lag) it surely must be obvious that a portion of the power stroke is lost, because, not only is the steam entering late, but the piston is actually running away from it! It is doubtful if full pressure ever is attained with a late opening, except at crawling speeds.

When the crank has completed half its revolution, and is at right-angles to the centre line of motion, it is in the best position to transmit power, and a fraction of the piston pressure suffices for that needed at the beginning of the stroke; therefore, with early admission, you can have early cut-off, let the expansion finish the stroke, keeping fairly even power at the wheel treads, and release the spent steam when the crank has got so far around, that nothing is to be gained by pushing it farther; early release keeps back-pressure to the minimum.

It is repeatedly argued that lead causes bad starting. A minute's consideration will show how ridiculous that contention is. Suppose one crank is on dead centre and the valve is open to lead; the port is just cracked, and the crank in the worst possible position to transmit power. Granted; but the crank on the opposite side is in the *best possible position* to transmit power, and the port is *wide open*. When the regulator is opened, steam goes into both steam chests together. Ask yourself the question: which piston is going to get the full pressure first, the one with the cracked port, or the one with the wide-open port? On top of that, the latter piston can exert many times the power on the crank, by virtue of the latter's best position; and so the engine will move off before any adverse effect has a chance of being felt on the opposite side. I have repeatedly demonstrated, by means of a chassis jacked up and operated by a tyre pump, that it is impossible to make an engine with my valve setting "kick back."

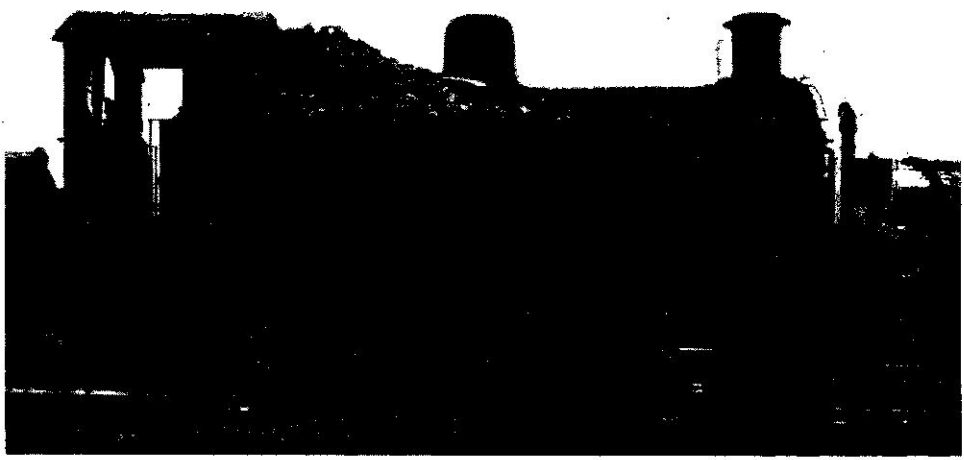
In the early days of these notes, a certain party boasted that he set his leads to $1\frac{1}{2}$ thousandths, with a bit of wire in the port. One of my faded Curly-coloured hairs mikes up to

just that; but the joke was, that on his engine, you could move the valves nearly $\frac{1}{16}$ in. by pulling at the valve fork, without turning the wheels! It is just as necessary to get the steam *into* the cylinder at the proper time, as it is to get it out; I found that out by experience, many years ago, turning a comparative failure into a huge success by throwing overboard all the "laws of the Medes and Persians," as expounded in this journal in the days before enlightenment came, and adopting the settings of the full-sized engine. Early exhaust is no good unless the admission is early, too; and both speed and power depend to a large extent on early admission. Ask Mr. Westbury what sort of a caper one of his pets would cut, firing on top dead centre, or after it, all the time, and then recollect that the explosion in the cylinder of an I.C. engine takes place in a fraction of the time taken by steam to get through a small crack and fill the passage-way and clearance space of a steam cylinder.

I trust the above will be useful to beginners and others who have hazy ideas about valve setting; everybody is welcome to his own opinion, but don't blame your humble servant if you set the valves of one of his "Live Steamers" in any other way but the one recommended, and she doesn't come up to expectations!

Mr. Cox's Engine as a Side Tank

In the notes about building the 5-in. gauge 0-4-0 saddle tank locomotive designed by Mr. Cox, I mentioned that it could be built as a side tank engine, with the advantage of greater water capacity, and less risk of the water in the tanks becoming too hot for injector feeding. Here is a picture of the actual type of engine I had in mind. She is—or was, I haven't been around that way for a long time—a familiar figure to all who travelled on the buses and other vehicles using East India Dock Road, Canning Town, where she could always be seen busily engaged in shunting wagons in the dock sidings. An untidy little lady, maybe, but a busy and useful one for all that! Note the absence of buffers; this is owing to the great amount of overhang, which would cause buffer-locking on the sharp curves of the dock sidings, if ordinary buffers were fitted.



The side-tank variation of Mr. Cox's "Tailwagger"

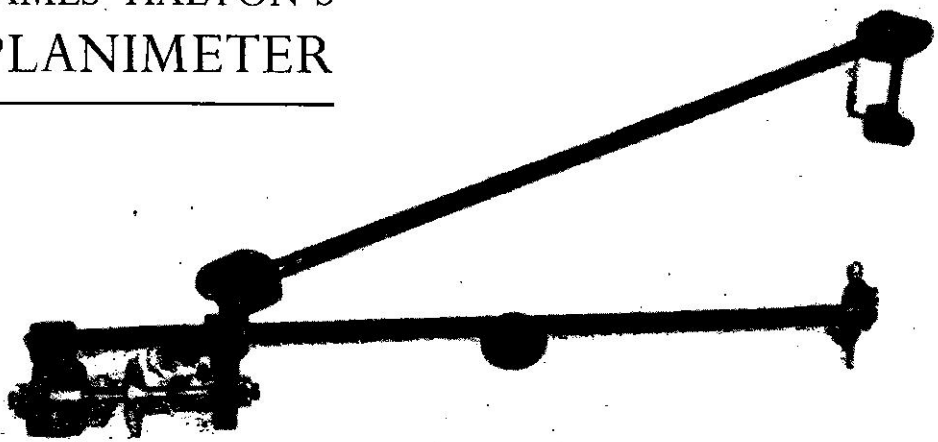
"Doodle Bug"

(*Continued from page* 138)

first road test on the Bryn track the engine was kept out of sight until the members gathered were interested in another locomotive. We then sneaked her on the road, and had steam up before most of them knew what was happening. The extra truck was hooked on, and amidst much back-chat the builder steamed proudly out. The liveliness of the little engine caused much comment, and our worthy chairman on his trip exclaimed, "This isn't a loco., it's a lethal weapon." "Yes," was Mr. Waterhouse's rejoinder, "a ruddy 'doodle bug,'" and "Doodle Bug" she remains.

I had a deal of pleasure in the building of the engine and would herewith like to express my appreciation of the kindness of my fellow-members of the Wigan S.M.E. who responded to my S.O.S. for some of the required bits and pieces. The photographs were taken by Mr J. L. Waterhouse.

JAMES HALTON'S PLANIMETER



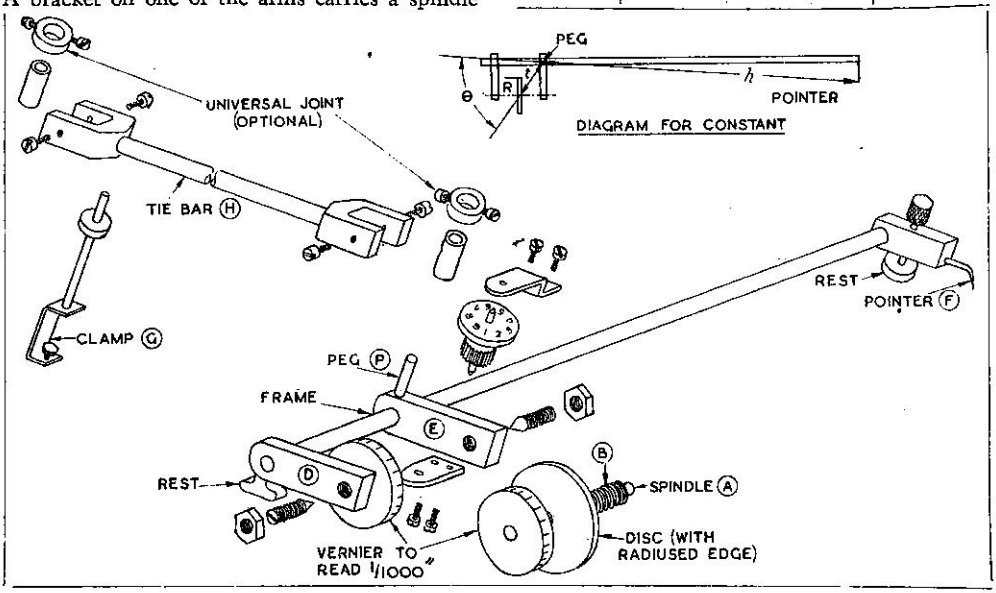
THE planimeter described here was constructed with the aim of aiding a friend of mine, who is a surveyor, in the calculation of the superficial area of plots of land; thus avoiding the very lengthy calculations involved in assessing it by triangulation, a method which inevitably lends itself to errors, due to a certain amount of guesswork being necessary. I do not intend to describe in detail the planimeter which I have constructed, but rather to outline the principles of this ingenious instrument, so that readers may modify it to suit their own requirements.

The planimeter consists essentially of a spindle *A*, which carries a worm *B*, and a vernier disc graduated in 1/100, together with the disc, which must be perfectly true and square. A bracket on one of the arms carries a spindle which has on it the worm-wheel to mesh with *B* and a disc carrying ten equal divisions. The worm and wheel having a 10-1 ratio, the rotations of the spindle are given on the disc, and parts of a revolution are read by the vernier.

This reading multiplied by a fixed constant determines the area of the field or park.

Example :—

Initial Reading Clockwise	Final Reading Clockwise	Mean Reading	Constant	Area
5.433	7.619	2.187	10	2.187 × 10
Anti-clockwise				21.87 sq.in.
5.431				



A reading is taken clockwise and then the path is retraced and the mean reading taken to obtain greater accuracy.

Other essentials consist of the brackets *D*, *E*, the pointer *F*, the clamp *G*, and the tie-rod *H*, all these being assembled as shown in the sketch.

The Constant

This may be calculated beforehand if desired, but I first of all made the instrument and then traced round the plan of a known area and then divided the area by the reading, which gave the constant. It will be seen that the planimeter calculates the area of an infinite number of sectors, so that the constant is found by the following formula, to a fair degree of accuracy.

$$C = \frac{k^2}{t} \times 2\pi R \times \frac{1}{\cos \theta}$$

The clamp *G* must be affixed to the edge of the drawing board, and outside the area to be found, but if desired this may take the form of a heavy cylindrical weight which may be placed in the centre of the area, provided that a circle of area equal to that traced out by peg *P* is added to the answer.

The construction of this interesting little job has afforded great pleasure to me, and will, I hope, give as much gratification to other constructors.

MODEL ELECTRIC TRACTION

H.J.H. contributes some pertinent comments upon this topical subject

ONE wonders if the recent correspondence may mark the dawn of a new era in this sphere of activity

Hitherto, with few exceptions, model electric locomotives have not been used to haul a living load. Now comes the desire to do this safely and in a manner worthy of advanced full-size practice. Simple as the change appears, it alters matters materially.

In the past, electrically-propelled model railway items have been of relatively small volume and provided with remote control as a desideratum. The new venture demands a safe gauge in order that the driver may ride upon the train and take all the usual lineside controls with him. As can be imagined, these items require a fair amount of room for their accommodation. It seems likely, therefore, that the refinements of electric traction may be confined to stock upon the wider gauges, particularly as still further equipment must be taken on board to obtain a semblance of full-size working. If one may hazard a guess, the most advanced type of working will appear on the 5-in. and wider gauges.

Room for Equipment

There is no particular difficulty in providing power for hauling heavy loads on comparatively narrow gauge tracks. The problem is to find room for the equipment; and this is none too easy, even by rearrangement. But greater will be the honour in having overcome it. Therein lies the incentive to the 2½-in. and 3½-in. gauge people who may feel a little disheartened at the prospects. Whether a single or multiple drive unit be employed, one would preferably introduce, in addition to the motors and controllers bipolar fuses, automatic cutouts, and an ammeter. The nature of the desire implies that braking can hardly be considered a luxury. Thus, to remain true to an ideal, one would probably add "Westinghouse" equipment and so instal the assigned motors, pumps, air cylinders, valves, and air lines. Sanding gear would not be out of place. As a further pretension to completeness, rheostatic braking might be attempted.

Further details could reasonably include automatic lubrication, voltmeter, spark-quenching gear such as magnetic arc-extinguishers, and possibly some form of thermostatic temperature control. In some cases automatic signalling and train control apparatus would not be out of place. Formidable as this list appears, one cannot escape the fact that on small editions, the appliances will be relatively more bulky than their full-size counterparts. Furthermore, if they are to give satisfactory service they must be quite robust in character.

Although the foregoing schedule may, or may not, be complete, care must be taken that transmission details are not forgotten when planning the placement of components. As the miniature hauler motors are not likely to have armatures directly on the axles, some form of gearing will be introduced. This, in keeping with other items will be proportionately larger than a scale reproduction.

Lifeless ?

One who is enthralled by the charms of steam will probably state that he is not likely to yield to the potency of electronics, for the simple reason that the electric contraption is as lifeless as a shoebox—or words to that effect. If this "feller" isn't disturbed regarding his future fuel supplies, one can only entice him into the realms of electric traction by explaining that it is the ideal form of transport, always ready for service; that the smell of ozone is far more beneficial than that of smoke and oil; that the "life" of a steam engine appears in some forms of hauler where moving coupling-rods are present. Alas! nothing can be done regarding the "soul" of a steam locomotive in the case of one attuned thereto.

The provision of coupling-rods promotes some feeling that power is visible and may be beneficial to design, since the driving wheels may be larger than they otherwise would be, and thus result in

steadier running and the better negotiation of canted curves owing to a relatively high centre of gravity. Low centres of gravity cause some concern to staffs on full-size railways and are best avoided if possible. All the same, the miniature railway operator must not overlook the other extreme. For in the case of miniature tracks will not the relatively high centre of gravity of the human freight, coupled with the track experience of that freight, control speed more than any rheostat?

Slipping

A matter which calls for examination rather than controversy, concerns some notes which appeared in *The Model Railway News*, during 1944, in which it was stated that less slipping occurred with model locomotives having large driving wheels than in the case of those with smaller ones. It looks as though jack-shafts and coupling-rods may be the order of the day.

The power required for passenger-hauling on a miniature track is surprisingly low, and if one cannot directly obtain the figure suited to the electrical viewpoint, it may be obtained by determining the i.h.p. of a small steam locomotive and then, by use of the appropriate equivalent, the electrical counterpart. The calculations are simple and, if carefully undertaken, may be extended to cover efficiency and other facts.

Very rightly, it has been stressed all through recent correspondence that passenger-hauling electrically must be done at safe voltages. Safe voltages are low voltages; but if they are too low, pick-up difficulties will be encountered on an outdoor track. Nevertheless, whether the supply be a.c. or d.c., it must be absolutely safe from the shock point of view. Probably 25 or 50 volts would be suitable pressures. Note, in passing, that the small accumulator locomotives used for mining and tunnelling often work on 60 to 80 volts. Incidentally, these haulers are mostly of 2-feet gauge and will run through curves of 13-feet radius with but little overhang.

The source of power supply may be either a permanent or portable generating plant on site; the supply mains with or without a rectifier; or an accumulator if d.c. is used. Primary batteries are not likely to find favour. If short-circuits become a common feature, nickel-steel accumulators may prove more suited to the work than the lead acid variety.

Voltage and Gauge

After some initial experiments, and before the state of the new art becomes too far advanced, it would be advisable to decide on a "universal" voltage and gauge of track so that an exchange of running powers is practicable. The output of a generating-plant in terms of watts will, to some extent, be governed by this development, as it should be quite practicable to run a plurality of trains at one time, with the possible introduction of automatic signalling and train-control measures.

Fortunately, the principles of motor design have been dealt with simply and efficiently in some handbooks published by THE MODEL ENGINEER, and there is also that invaluable reference book entitled *Model Electric Locomotives and Railways*, written by Mr. Henry Greenly, to which one can refer for traction motor and transmission details. Comparable with dependable books, none of these references is yet superseded, or ever can be. For, human nature, being what it is, compels one possessed of accumulated knowledge and absorbed in up-to-date practice to study older treatises with a view to obtaining a clearer conception of the foundation upon which present developments are based, and thus a better understanding of a particular subject as a whole.

Model Motors

In some respects "model" motors follow full-size practice; but now the small traction motor has apparently to function as its big brother. With new developments it is expected that the permanent-magnet type of motor will continue to be used in the smaller remote-controlled locomotives, whilst the wound-field kind will come more into its own on miniature railways, now that its controls will be adjacent.

Traction motors are usually series-wound to permit the development of a large torque when starting and at slow speeds. The speed regulation of a "model" is usually effected by means of a variable resistance external to the circuit within the confines of the motor. But when the driver is carried on the train, it will be possible to experiment with the alternative, wherein the resistance is used to weaken the magnetic field. The most economical form of control is the series-parallel method. In this arrangement the speed is low with the motors in series and relatively greater when they are in parallel, and it has the advantage of eliminating a wasteful resistance. However, a resistance is employed at the commencement of the series-parallel connections to further graduate the speed.

Outline

As regards outline, some will prefer modelling in the academic sense, while others will, owing to the serious nature of the proposed task, design and produce a job especially for the work. In either case, it is wise to take precautions, reducing the risk of mechanical injury to the functional parts, by adopting a rugged construction and total enclosure when possible.

Should steam outlines be followed, it is suggested that the controls be designed to operate as closely as possible to those on a steam locomotive. Perhaps, with the aid of a pulsating blower and some pyrotechnical device, smoke may be caused to issue from the chimney. To the emission a modicum of hot oil effluvium might possibly be added. But in so doing it would be departing from the original proposal of hauling passengers safely with all the refinement of modern electric traction.

So, Mr. Motorman, the position appears to be this: If you can find the necessary space to meet the extent of your demands, the rest is a matter of study, experiment and skill. Good luck to you! Please be sure to let us know how you are progressing with the subject of your choice.

Clubs

The Model Engineers' Society, Northern Ireland

A meeting of the above Society was held at the Clubroom recently, when a demonstration of hard- and soft-soldering, also a talk on the machining of "locomotive" cylinders was given by two of the members. The next meeting will be held in Room No. 10, at the C.I.Y.M.S., 20, Donegall Square East, Belfast, when Mr. Robb will show an excellent example of the chassis for "Hielan' Lassie." All interested should get in touch with our Hon. Secretary: H. G. CALDWELL, 5, McAuley Street, Belfast.

Mansfield and District Model Engineering and Handicrafts Society

The boilers for the two "Midge" type engines are now well under way, and next job will be the patterns for wheels, cylinders, etc. It is hoped in the next few weeks to arrange visits to Messrs. Myfords, Willimotts, and other engineering firms, also a club visit to THE MODEL ENGINEER Exhibition. All members please note, further particulars regarding the above, also of membership, apply to the Hon. Secretary: J. CORBETT (Lathes), Stanton Hill, Nr. Mansfield. Telephone: 583 Sutton-in-Ashfield.

The Bristol Society of Model and Experimental Engineers

At our meeting on Thursday, July 18th, we had a talk on "Valve Gear and Timing" by one of our members, Mr. S. F. Holland, who also answered many queries raised by members on this subject.

Hon. Secretary: C. C. LUCY, 28 Bibury Crescent, Henleaze, Bristol.

The Kent Model Engineering Society

On July 15th the members had the pleasure of seeing a film entitled: "A Study in Steel," which showed the building of an L.M.S. "Princess Royal" class locomotive from the drawing board to the finished engine. The film was kindly loaned by Messrs. Bassett-Lowke, and was shown by Major Binyon on his 16-mm. projector.

One of our members, Mr. A. B. Storrar, has very kindly offered to give a prize of £1 for the best written appreciation of the MODEL ENGINEER Exhibition. This award will take place on September 9th.

The following meetings have been arranged:—August 12th, Preliminary display of models for the Club stand at the Exhibition; August 19th, Informal meeting; August 26th, No meeting; September 2nd, Problem night; September 16th, Erection of Club lathe and bench, etc., under the direction of Mr. Mountain.

A sub-committee has been formed to choose the models which are to be shown on the Club stand at the MODEL ENGINEER Exhibition. This sub-committee consists of three members:—Mr. E. Vanner, Mr. G. Ash, and Mr. V. Wattingham.

Hon. Secretary: A. F. BROCK, 342, Green Lane, New Eltham, S.E.9. Telephone: ELT 2342.

Cardiff and District Society of Model and Experimental Engineers

Fixtures for the next two months are as follow:—August 21st, Lecture on "High Voltage Electricity," by our President, Mr. Edward Jones, M.I.E.E., M.I.Mech.E.; August 28th, Visit to the Newport Road Power Station, of which the President is Chief; September 4th, Lecture by a P.O. engineer on the mechanical side of Post Office work; September 11th, Visit to Central Post Office, Cardiff.

The "Quiz" held at our last meeting proved highly successful and entertaining, the youngest member walking off with highest honours!

Hon. Secretary: F. B. ANGWIN, 47, Romilly Crescent, Cardiff.

The Tonbridge and District Model Experimental Engineering Society

Though reports have not appeared in the Press for some time past, this does not mean that the Society has not continued to make progress.

During the six months January to June, interesting talks have been given by Mr. C. R. Gordon Stuart, and Mr. Edgar T. Westbury; two film shows have been given, one by Mr. E. R. Padgham through his own projector, and one with films kindly loaned by the Southern Railway.

Two issues of the Society's own magazine, *Motion*, have been produced by our popular Editor, Mr. P. Fraser, and a library has been started which is in the capable hands of Mr. C. C. Langer, as Librarian. Further books to extend the library would be welcomed.

The high light of the period was undoubtedly the visit to the track of Messrs. J. & E. Hall Ltd's. Social and Athletic Club, at Dartford, on May 4th, and the thanks of the members are due to Mr. C. Harris, the Secretary of their Model Engineering Section, and his Committee for the hospitality extended to us on that occasion. An enjoyable afternoon was also spent on June 1st at "The Warren," Brenchley, by kind invitation of our Vice-Chairman, Mr. C. C. Langer.

Progress has been made on the Society's model of the "Austerity" locomotive, and the first 120 ft. of track has been laid on ground which has kindly been placed at the disposal of the Society by Messrs. E.C.D. Ltd.

Any "lone hands" working in this area will be welcomed to the Society, and they are invited to communicate with the Secretary, A. R. JUDD, 13, Mountfield Park, Tonbridge, Kent.

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Readers desiring to see the Editor personally can only do so by making an appointment in advance.

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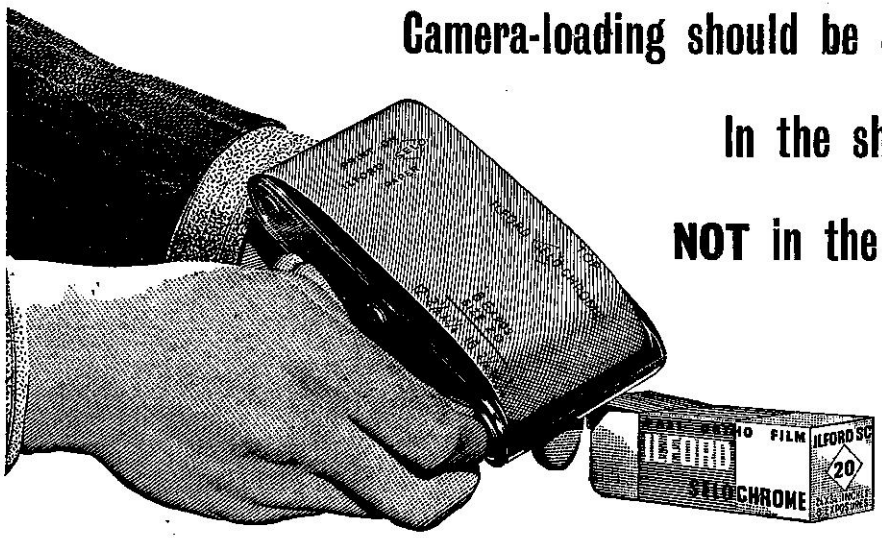

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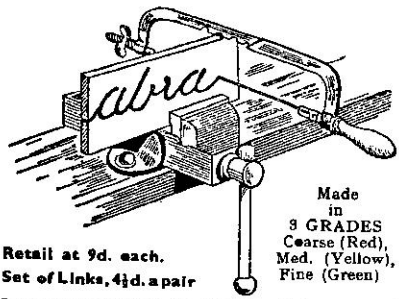

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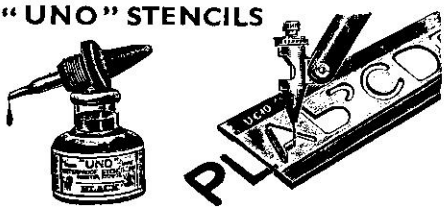

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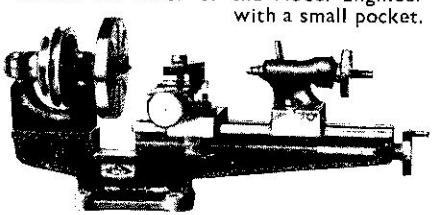

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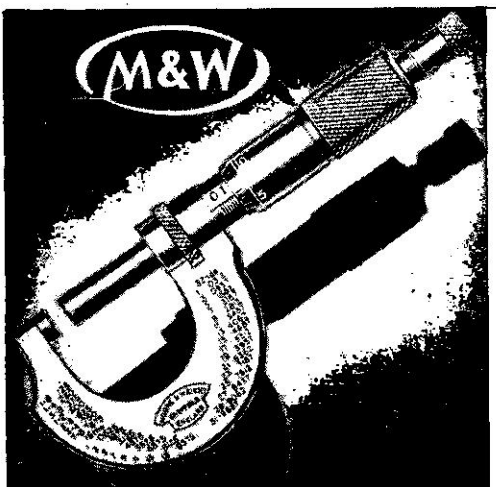

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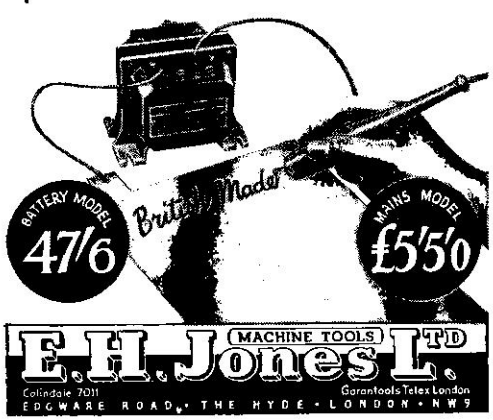

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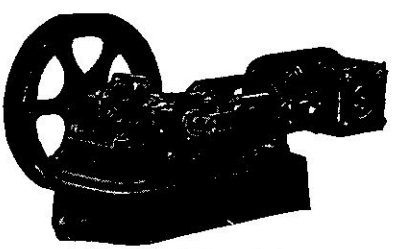

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